# SURVEY OF MISSISSIPPI, SAINT CROIX, CHIPPEWA, AND WISCONSIN RIVERS.

## LETTER

FROM

## THE SECRETARY OF WAR,

TRANSMITTING

*Report on surveys of Mississippi, Saint Croix, Chippewa, and Wisconsin Rivers.*

FEBRUARY 9, 1880.—Referred to the Committee on Commerce and ordered to be printed.

WAR DEPARTMENT,
*Washington City, February 7, 1880.*

The Secretary of War has the honor to transmit to the House of Representatives a letter of the Chief of Engineers dated the 6th instant, and accompanying copy of reports from Capt. C. J. Allen, Corps of Engineers, on surveys and examinations made in accordance with the provisions of river and harbor acts of June 18, 1878, and March 3, 1879, to determine the practicability and cost of creating and maintaining reservoirs upon the headwaters of the Mississippi River, and upon those of the Saint Croix, Chippewa, and Wisconsin Rivers and their tributaries, for the purpose of regulating the volume of water and improving the navigation of those rivers. Also a general map of the sources of these rivers, which it is requested may be printed with the report.

Other maps will be forwarded in a few days.

ALEX. RAMSEY,
*Secretary of War.*

The SPEAKER
*Of the House of Representatives.*

OFFICE OF THE CHIEF OF ENGINEERS,
*Washington, D. C., February 6, 1880.*

SIR: In compliance with provisions of the river and harbor acts of June 18, 1878, and March 3, 1879, I have the honor to submit herewith copies of reports to this office from Capt. C. J. Allen, Corps of Engineers, showing the progress and results of surveys and examinations made under his direction to determine the practicability and cost of creating

and maintaining reservoirs upon the headwaters of the Mississippi River and upon those of the Saint Croix River in Wisconsin and Minnesota and of the Chippewa and Wisconsin Rivers in Wisconsin, and their tributaries, for the purpose of regulating the volume of water and improving the navigation of those rivers.

A general map of the sources of these rivers showing the proposed reservoirs is also submitted, with the recommendation that it be printed with the report. Maps on a larger scale showing the headwaters of each stream and the location of the reservoirs more in detail will be submitted in a few days for further elucidation of this report.

Very respectfully, your obedient servant,

H. G. WRIGHT,
*Chief of Engineers, Brig. & Bvt. Maj. Gen., U. S. A.*

Hon. ALEXANDER RAMSEY,
*Secretary of War.*

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EXAMINATIONS AND SURVEYS AT HEADWATERS OF THE MISSISSIPPI RIVER, WITH A VIEW TO FEASIBILITY, COST, &c., OF CONSTRUCTING AND MAINTAINING RESERVOIRS FOR THE IMPROVEMENT OF THE NAVIGATION OF THAT STREAM, IN ACCORDANCE WITH ACTS OF CONGRESS OF JUNE 18, 1878, AND MARCH 3, 1879.

ENGINEER OFFICE, UNITED STATES ARMY,
*Saint Paul, December* 12, 1879.

GENERAL: I have the honor to submit the following progress report pertaining to the proposed system of reservoirs at the sources of the Mississippi River.

My last report upon this subject, dated January 15, 1879, contained an estimate of $336,458.60 for the construction of seven dams to create reservoirs at Lake Winnibigoshish, Leech Lake, Mud Lake, below Vermillion River, at Pokegama Falls, at Gull Lake, and at Pine River; also an estimate of the cost of maintenance, understanding by this the necessary repairs for the first ten years, and in addition an estimate of the cost per annum of operating the dams, cost of telegraph lines, &c. There appears no reason for changing the above estimate, excepting in so far as the increase in prices of material and labor since then. On account of the increase in prices it seems prudent to add at least 15 per cent. to the above estimates, making the total cost of the dams and appurtenances $386,927.39, and the cost of telegraph lines, including batteries, &c., $15,525. The cost of repairs for the first ten years being difficult to state with anything like accuracy, may be left as rendered in last report, as well as the cost per annum ($7,840) of operating the system of dams.

The examinations pertaining to the sources of the Mississippi during the past season have mainly consisted in meteorological observations and gaugings of the flow in the streams. Three meteorological stations have been steadily maintained, viz, one at Leech Lake, one at White Earth, and one at Red Lake, the latter point chosen as it is on the "divide" of the waters flowing into Cass, Winnibigoshish, and other lakes supplying the Mississippi and waters flowing into the Red River of the North, the annual quantity of precipitation decreasing, as may be seen by an inspection of the tables appended to this and also my last report, as we go north and west, and increasing generally as we go east and south from Red Lake. Before the establishment of these meteoro-

logical stations, no satisfactory data were at hand upon which to base estimates of the supply of water, the only method being to obtain a mean of the precipitation recorded for a number of years at military and other posts in the regions adjoining the area of country under consideration. The computation by this method compared favorably with that made by taking the low-water discharges of the streams, so far as could be done, for one of the factors. The average annual precipitation for the entire area was assumed at 25 inches, and 0′.7 assumed as the portion actually finding its way into the streams, and which could be depended upon to subserve the purposes of the reservoirs, the rest supposed to be lost by evaporation, infiltration, demands of vegetation, &c. Continuous observations at these stations for 15 months give the following:

*Table of inches of rainfall from September* 1, 1878, *to December* 1, 1879.

| Locality. | September. | October. | November. | December. | January. | February. | March. | April. |
|---|---|---|---|---|---|---|---|---|
| Leech Lake, Minn | 2.18 | 4.00 | 0.20 | 0.30 | 0.00 | 0.00 | 1.60 | 0.70 |
| Red Lake, Minn | 3.28 | 1.95 | 0.06 | 0.95 | 0.50 | 1.10 | 0.42 | 0.96 |
| White Earth, Minn | 2.23 | 1.75 | 1.03 | 0.54 | 0.10 | 0.51 | 0.42 | 1.08 |
| Fort Snelling, Minn | 3.53 | 2.14 | 2.60 | 1.19 | 0.17 | 2.36 | 1.20 | 0.64 |
| Saint Paul, Minn | 2.13 | 1.85 | 0.61 | 1.04 | 0.11 | 1.12 | 0.97 | 0.45 |

| Locality. | May. | June. | July. | August. | September. | October. | November. |
|---|---|---|---|---|---|---|---|
| Leech Lake, Minn | 5.15 | 4.50 | 3.81 | 2.05 | 2.18 | 2.35 | 0.25 |
| Red Lake, Minn | 2.19 | 4.63 | 3.23 | 2.20 | 0.89 | 2.19 | 0.18 |
| White Earth, Minn | 1.86 | 6.97 | 7.08 | 6.60 | 1.61 | 7.08 | 0.34 |
| Fort Snelling, Minn | 7.82 | 2.45 | 9.71 | 2.42 | 1.58 | 3.48 | 2.25 |
| Saint Paul, Minn | 7.18 | 1.76 | 9.32 | 2.78 | 2.26 | 2.56 | 1.41 |

It will be seen by inspection of the above table that the rainfall at Leech Lake was the same in amount in September, 1878, as in September, 1879; that in October, 1878, 1.65 inches more were recorded than for the same month in 1879; and that in November, 1879, 0.05 inch more rainfall was measured than in November, 1878. At Red Lake for the months of September, October, and November, 1878, the records show, respectively, 3.28 inches, 1.95 inches, and 0.06 inch; while for 1879, for the same months and in the order named, the records show 0.89 inch, 2.19 inches, and 0.18 inch.

The White Earth records show for September, October, and November, 1878, 2.23 inches, 1.75 inches, and 1.03 inches; while, for the corresponding months in 1879, the records are 1.61 inches, 7.08 inches, and 0.34 inch.

The mean of the rainfall at these stations for the above-named months of 1878, is 1.85 inches, while for the same period in 1879 it is 1.90 inches or about the same in value. An unusual quantity of rain is reported to have fallen at White Earth during the month of October and the records confirm the statement. For purposes of calculation of the supply it will be necessary to consider the rainfall for one year, and the period from September 1, 1878, the earliest date at which reliable observations were

commenced at the White Earth, Leech Lake, and Red Lake stations is accordingly taken. The yearly amount at each of the above is—

| | Inches. |
|---|---|
| At Leech Lake | 24.49 |
| At Red Lake | 21.47 |
| At White Earth | 30.17 |
| Mean | = 25.37 |

By glancing at the map it will be seen that Cass and Winnibigoshish Lakes are nearly equidistant from the Red Lake and White Earth stations, and that White Earth, although in the watershed of the Red River, is but a short distance from Lake Itasca. Duluth, also a meteorological station, lies about 110 miles to the east and south of Lake Winnibigoshish, but its rainfall is not here considered on account of the meteorological conditions of that station. Pine River and Gull Lake are about midway between Leech Lake and Fort Ripley.

Itasca, Cass, and Winnibigoshish Lakes form part of the Mississippi proper. For the Winnibigoshish basin, it is fair to assume, for the rainfall during the year under consideration, a mean of that at Red Lake, White Earth, and Leech Lake, or, 25.37 inches. For the Leech Lake basin, we take its own record, viz, 24.49 inches. For the Mud Lake, Vermillion, and Pokegama basins, the Leech Lake record will apply, as can be seen by inspecting the map. For the Gull Lake and Pine River basins, a mean of the precipitation, as recorded at Leech Lake and Fort Ripley, is assumed, the mean being 25.9 inches. For the entire basin of the Mississippi above Saint Paul, the mean of the observations for the period from September 1, 1878, to September 1, 1879, including those of Saint Paul, gives 26.36 inches, and, including 36.23 inches at Fort Snelling, for the same period, the mean is about 28.34 inches. This, however, would be too great for the whole basin, on account of the proximity of Fort Snelling to Saint Paul.

It is apparent, then, that the value, 25 inches, assumed in my last report, as the average rainfall over the entire basin is within safe limits, and that the calculations based upon that factor need not be changed.

The determination of the available amount of precipitation, that which actually finds its way into the streams, after allowing for evaporation, &c., is very difficult. Observations for evaporation have been made at the three meteorological stations established near the sources of the river, as well as some at Saint Paul, to determine the ratio between the evaporation from open surfaces of water and that from the marsh. These, together with accompanying observations for temperature and force and direction of wind, afford some data applicable, perhaps, to particular cases, but of little use in determining questions covering large areas of country broken by marsh, forest, streamlets, lakes, &c. Gaugings of the streams, and, especially, of the main stream, to which the whole area is tributary, if long continued, would afford means, by comparison with the total rainfall in any one year multiplied into the area of watershed, of determining, approximately, the amount of water lost by infiltration, evaporation, vegetation, &c., although not the amount due to each item. Again, some of the small lakes contained in the watershed have no visible outlets, although large portions of the rain received by them must eventually find its way into the streams.

Fortunately our meteorological observations since September, 1878, have enabled us to assign a mean value, with confidence, to the annual precipitation for the entire area so as to compare measured discharges of the river during a considerable period of time at Brainerd and Sauk

Rapids, and thereby deduce the quantity of water flowing for the same period past Pokegama Falls. The area of country tributary to the river at Pokegama Falls is 3,665 square miles; the area tributary to the river above the mouth of Crow Wing River, just below Brainerd, is 7,729 square miles; and the area tributary to the river at Sauk Rapids is 13.872 square miles. The ratios being as follows: That tributary to the river at Brainerd to that tributary at Pokegama Falls, 0.475, and that at Sauk Rapids to the area above Pokegama, 0.264. And the ratio between the area tributary to the river at Sauk Rapids and that tributary at Brainerd is about 0.557. In 1875, a series of gaugings, to determine the discharge, was taken at Brainerd and Sauk Rapids, and at other points below, from which, together with daily observations of the stage of water, was deduced and plotted for each point, a curve of discharges covering a period of time from about the middle of April to the middle of October, 1875. The measured and calculated discharge of water past Sauk Rapids, from April 15, to July 1, 1878, was 155,158,120,000 cubic feet of water; that at Brainerd, for the same period, 89,562,240,000 cubic feet. Now, on the principle that, if the rainfall is equal over the areas tributary to the stream at these points, the quantities of water passing the two points should be proportional to the areas, we have the proportion—

$$7729 : 13872 :: 89{,}562{,}240{,}000 : \varphi,$$

$\varphi$ being the quantity of water flowing past Brainerd.

The above proportion gives, for the value of $\varphi$ about 160,700,000,000, a difference, from the measured and calculated volume of, in round numbers, 5,500,000,000 cubic feet, a percentage of less than 4. This close agreement enables us to use the coefficients above stated for the calculation of the discharge past Pokegama from the measurements at Brainerd and Sauk Rapids. The discharge past Brainerd being, for the period from April 15, to July 1, inclusive, 89,562,240,000 cubic feet, we have, after multiplying it into the coefficient 0.475, 42,542,064,000 cubic feet, as the quantity passing Pokegama Falls during that time.

The discharge, past Sauk Rapids, for the same period, being 155,158,120,000 cubic feet, we have, after multiplying the amount by the coefficient 0.264, 40,961,743,680 cubic feet. The mean of the two would be 41,751,903,840 cubic feet.

Now, prior to the 15th of April, there was, as a matter of course, considerable water passing Pokegama Falls, for the discharge could not advance from zero, on the 14th of April, to 10,400 cubic feet on the 15th, at Brainerd, nor could all the water on the last-named date have come from the watershed immediately at Brainerd. The quantity of water, just calculated, came from melted snow, early spring rains, &c., the melted snow from precipitation during the winter months.

From December 10 to April 1 we may regard the water-courses as ice-bound to the extent of admitting but a very slight flow of water. It would be a small estimate to allow 3,000 cubic feet per second as passing Pokegama Falls for a period of 15 days to represent the total quantity of water escaping from the watershed above Pokegama Falls from December 10 to April 15, a period of 125 days, or, per second, $\frac{45{,}000 \times 86{,}400}{125 \times 86{,}400} =$ 360 cubic feet per second.

The reservoirs, if operated in the interest of navigation, would seldom, if ever, be opened after November 1. It would not require less than 15 days (probably 20 days), for the waters liberated from the upper reservoirs to prove of effect at Saint Paul. Hence, there would be little occasion for opening the gates after November 1. An inspection of the gaugings

of the streams above and at Pokegama will make it evident that we are fully justified in assuming a mean discharge past Pokegama, from November 1 to December 10, a period of 40 days, of 1,000 cubic feet of water per second. Collecting, then, this item, and the 3,000 cubic feet per second for the 15 days in April, we have to add to the quantity deduced from measurements $(40{,}000 + 45{,}000) \times 86{,}400 = 7{,}344{,}000{,}000$ cubic feet. And, for the entire quantity passing Pokegama Falls to be impounded by reservoirs, we have 41,751,903,840 cubic feet + 7,344,000,000 cubic feet equal to 49,095,903,840 cubic feet. This is the quantity for only five of the reservoirs.

Turning our attention now to the proposed reservoirs at Gull Lake and Pine River, we find (see report of January 15, 1879) that the supply to those reservoirs, calculated from the available rainfall, is 15,933,273,750 cubic feet. But our calculations for the reservoirs above Pokegama Falls, based upon rainfall, gives 71,052,999,653 cubic feet, as against 49,095,903,840, or about one-third more than by the calculations in this report. Making the correction and allowing for the capacities of the reservoirs, we have for Gull Lake and Pine River, in round numbers, 6,700,000,000 cubic feet more, and this, added to the quantity for the five reservoirs, gives, in the aggregate for the entire system of seven reservoirs, 55,795,903,840 cubic feet available for use by the 1st of July.

This calculation is based upon severe hypothesis; but even supposing the quantity just named to be all that can be impounded, it will give us for 100 days a little more than 6,400 cubic feet per second as an increment to the lower river after July 1. The Pine River reservoir will furnish a small surplus, 250 cubic feet per second for 100 days, its capacity not being equal to the supply, which surplus was not considered in the above aggregate.

Now, during the lowest stages of the navigation period, the discharge of the river at Saint Paul is not less than 5,800 cubic feet per second, which discharge is supplied, in small part, from the watershed tributary to Pokegama Falls, but late in the fall. We have supposed the reservoirs not to be closed after the 1st of July. The average discharge past Saint Paul prior to this low stage is in excess of 5,800 cubic feet, and it would not probably be necessary to open the gates of the reservoirs before July 15, so that the 100 days increment could be economized. It is claimed by some that much of the increment will be lost by evaporation and absorption. Let us assume that for 100 days the evaporation is at the rate of 0.1 inch per day, or 10 inches in all, and that there are no days of no evaporation. If the increment increases the average width of the river 200 feet (a large allowance), we would have as the loss by evaporation for that period $200 \times 5{,}280 \times 350 \times 0.83 = 306{,}768{,}000$ cubic feet, or, for 100 days, about 35 cubic feet per second. Pokegama is distant about 350 miles from Saint Paul by river.

Absorption is a more difficult factor to arrive at, but that the ground-water due to the quantity of rainfall not regarded as available for the supply of the water-courses could be so exhausted as to admit of the abstraction of any undue quantity of water from the river after receiving its increment from the reservoirs is out of the question. Besides, we have a surplus of 250 cubic feet per second from the Pine River reservoir.

We can, then, adding the 5,800 cubic feet of water passing Saint Paul at lowest stage to the 6,400 cubic feet from the reservoirs, rely upon at least 12,200 cubic feet of water past this point for 100 days of low-water navigation, and this is within 300 cubic feet per second of the

quantity stated in my last report and based upon two methods of calculation, each differing from the one employed in this report.

The year 1875 was only a year of average rainfall; so was the year preceding it. The mean of the rainfall at Saint Paul, Fort Snelling, Duluth, and Pembina, for 1874, was 26.47 inches; for the same stations in 1875 it was 24.63 inches; for 1876, 27.14 inches; and for 1877, 28.61 inches.

As to the utility of 12,200 cubic feet of water per second for 100 days when navigation is generally impeded. A discharge of 3,500 cubic feet per second above Brainerd affords good navigation from that point to Grand Rapids, a distance of 180 miles; 12,000 cubic feet affords good navigation upon all the navigable stretches of river above Minneapolis, not including those portions where the worst rapids exist; lumber camps have been largely supplied by steamers plying from Brainerd northward; 12,200 cubic feet of water per second is more than double the low-water discharge past Saint Paul. The stream must be despicable whose navigation could not be assisted by doubling its lowest-water volume.

A discharge of 12,200 cubic feet per second at Saint Paul would probably correspond to a width between this point and the head of Lake Pepin of about 1,000 to 1,500 feet, excepting in some few cases where large groups of islands occur. At Fridley's Bar, above Minneapolis, a gauging in 1875 gave, for a discharge of 16,876 cubic feet, and stage of the river 3′.63 above low-water, a mean velocity of 3′.04. If we take, for a discharge of 12,200 cubic feet, the mean velocity at 3 feet, and width at 1,000 feet, we have, assuming the area of cross-section to be a rectangle, a depth of about 4 feet. But the cross-section of a stream flowing through a sandy bed does not approach the rectangular; it varies, sometimes approaching the parabolic, and sometimes the triangular. The height of a triangle, having a base of 1,000 feet, and area of 4,000 square feet$=\frac{12000}{3}$, would be 8 feet. It would certainly be within safe limits to say that, supposing the width of water surface to be as high as 1,500 feet, the ruling depth for a flow of 12,200 feet per second would be at the least 4 feet. The Rock Island Rapids, 385 miles below Saint Paul, have been improved so as to afford a depth of 4 feet at low-water.

The head of Lake Pepin is about 55 miles below Saint Paul. The Saint Croix River flows into the Mississippi about 30 miles below Saint Paul. Its measured lowest-water volume is about 3,000 cubic feet per second, and this quantity added to the 12,200 cubic feet will increase the depth in the channel below the junction, and whatever increment can be added to that volume by the storage of water in reservoirs will add to the beneficial results.

A steady flow of 12,200 cubic feet per second above Minneapolis will render unnecessary most of the wing-dams, jetties, and other works reported as necessary for the improvement of navigable stretches above that place.

The establishment of reservoirs at the sources of the Mississippi will—

1st. Benefit navigation from Grand Rapids to the head of Lake Pepin.

2d. Render valuable, for purposes of agriculture, large tracts of land between Grand Rapids and Fort Ripley.

In my last report I discussed, at length, the capacities of the channels to accommodate the impounded water. An adequate appropriation to clear the river of snags and other obstructions would, besides benefiting navigation above Brainerd, facilitate the flow of water.

The report of January 15, 1879, *which should be considered in connection with this report*, recommended an appropriation of $70,000 for the erection of a dam at Lake Winnibigoshish to test the system proposed. On account of advance in prices of material and labor, I would increase that estimate to $80,000; also, because the "plant" necessary would be nearly the same as that required for the construction of the entire system. No material benefits to navigation could accrue from a single dam and reservoir, and unless the entire system proposed be eventually adopted the establishment of a solitary reservoir would be useless, excepting as a demonstration of the feasibility of the reservoirs.

The Mississippi River below Saint Paul is not under my charge, but it is necessary to touch upon it, as the act of Congress ordering the examinations and surveys for reservoirs reads:

> The examination of the sources of the Mississippi River, and of the Saint Croix River in Wisconsin and Minnesota, and of the Chippewa and Wisconsin Rivers in the State of Wisconsin, to determine the practicability and cost of creating and maintaining reservoirs upon the headwaters of said rivers and their tributaries, for the purpose of regulating the volume of water and improving the navigation of said rivers and that of the Mississippi River, and an estimate of the damage to result therefrom to property of any kind.

The locations and dimensions of the several dams proposed provide, as much as possible, against any increase in surface subject to evaporation, and against undue overflow of adjoining lands. The height of the proposed dam at Pokegama Falls is limited by the height of the banks at the southern end of Pokegama Lake.

As noted above, the rainfall over the entire watershed for the months of July, August, September, and October has been left out in the calculations of the quantity to be impounded by July 1, allowing this for ordinary and low-water discharge of the river during those months. The mean discharge during these four months due to the rainfall is considerably in excess of 5,800 cubic feet.

With this report are inclosed:

1. Tracing showing proposed system of reservoirs above the Falls of Pokegama.
2. Tracing showing the locations of all the dams proposed for the sources of the Mississippi.
3. Plottings of gauge readings in 1879 at Saint Paul, Brainerd, Falls of Saint Anthony, Aitkin, Sauk Rapids, Leech Lake.
4. Report of Assistant J. D. Skinner, under date of December 1, 1879, with appended tables of rainfall, evaporation, and discharges of streams.
5. Table of lands liable to be overflowed, stating those portions that have been entered. This list is thought to be quite correct for the area above Pokegama Falls. For the Gull Lake and Pine River reservoirs they are only approximately correct.

Further examination will be made as soon as practicable, and the results reported.

Very respectfully, your obedient servant,

CHAS. J. ALLEN,
*Captain of Engineers.*

Brig. Gen. H. G. WRIGHT,
*Chief of Engineers, U. S. A.*

REPORT OF MR. JAMES D. SKINNER, ASSISTANT ENGINEER.

ENGINEER OFFICE, UNITED STATES ARMY,
*Saint Paul, December* 1, 1879.

MAJOR: I have the honor to submit the following report of work done on the headwaters of the Mississippi River during the current year, with a view to perfecting and completing the surveys and other work of 1874 and last year, whose object was to ascertain the practicability of establishing reservoirs thereon.

The examination of the dam-sites and all other work connected with the survey of the located system of reservoirs was so far completed last year as to leave nothing undone, except further gaugings of the Mississippi River, which the early closing of the river prevented in the fall of 1878.

These have been made with most satisfactory results, affording a complete set of high and low water gaugings, from Leech and Winnibigoshish Lakes as far down as Aitkin on the Northern Pacific Railroad. The former gaugings were made in 1874, when the river was at a high stage, and the latter in 1878 and 1879, the river being very low, and at about the same stage during each of the latter years.

The ratio between the discharges at the different stages and at the same places, attests the correctness of the work*. This, by referring to the annexed table of discharges, will be seen to be very uniform; the height above low water, noted in the table, being taken into consideration.

The three meteorological stations, at Red and Leech Lakes and at White Earth, have been maintained, and observations for rainfall, evaporation, and temperature have been regularly taken.

The records of rainfall and temperature are unbroken since September 1, of last year, and the evaporation for each day, when no ice had formed, has also been kept.

The rainfall for the year extending from September 1, 1878, to September 1, 1879, Saint Paul being included with the above stations, gives an average of 26.36 inches, as will be seen by a reference to the annexed table.

When it is considered that the summer months were unusually rainy, the average, taken last year from former reports and slightly reduced for safety, *i. e.*, 25 inches, would seem to be borne out by this year's observations.

I think there is no reason to change last year's computations.

Besides the regular observations for evaporation, which were made in the usual zinc pans with scale and micrometer screw attached, another set, during the months of September, October and November, 1879, was carefully taken in Saint Paul, to determine the coefficient to be applied to the readings of exposed pans, to reduce them to the natural evaporation from a pond or lake, which has only its surface exposed to the action of the sun and wind, while the pan has, in addition, its bottom and outside surface so exposed. To obtain this, one pan was placed as usual and an another was buried to its rim in earth, which was kept moist, and whose surface was covered with thin grass. These were regularly read and results compared.

The co efficient so obtained was 0.78; but when I reflected that the observations did not begin until September, and that the summer and spring months, when a greater difference might naturally be expected, were left out, I determined to reduce this to 0.7. Another year's full set of observations will decide whether this assumption is correct or not.

The results, this coefficient being applied to the readings in the annexed table, are for mean daily evaporation:

| | Inches. |
|---|---|
| Saint Paul, September to November, 1879, inclusive | 0.111 |
| White Earth, April to November, 1879, inclusive | 0.142 |
| Red Lake, May to November, 1879, inclusive | 0.112 |
| Leech Lake, April to November, 1879, inclusive | 0.087 |

When the different periods of time and the varying latitudes and situations of the stations are considered, I do not think the above results will be found very inconsistent. Another year's observation, will, however, determine this.

In my last year's report I assumed, from what data we then had, "at least 0.1 inch" as the average daily evaporation from April 1 to November 1. The above results would seem to justify that assumption, the mean being 0.114 inch.

I annex the following tables:

I. Discharge of the Upper Mississippi River at different points for the years 1874, 1878, and 1879.

II. Monthly rainfall from September 1, 1878, to September 1, 1879, with total for year at Leech Lake, White Earth, Red Lake, and Saint Paul. Also, the same from September 1, 1878, to December 1, 1879.

III. Mean daily evaporation for 1879, from April to October, both included, from recorded readings.

* Observations for coefficient multiplied by 0.7.

IV. Observations to determine coefficient to be applied to exposed evaporator, taken at Saint Paul during September, October, and November, 1879.

There is also attached a tracing, showing the location and height of the different dams, the slope of the river, the level of the reservoirs, and the general features of the country.

The question has been asked why it is not possible to build a single dam at Pokegama Falls, which would answer the purposes of the system recommended. This question will be found partially answered in Colonel Farquhar's report of 1875, and in last year's report. It can further be safely said that the expense of such a dam, were it practicable, with the attendant dike at the southeast end of Pokegama Lake, would vastly exceed the cost of the present system. Besides, great danger at the dike would result from the construction of the dam. There an accident would be fatal, whereas any damage at the proposed dams would be insignificant and easily repaired.

Further, an attempt to flow to any extent the natural reservoirs at Leech and Winnibigoshish Lakes would be an absurdity, as a glance at the accompanying profile will show. The country below is flat for the most part, and the banks of the river are low, and these when overflowed afford access to immense swamps.

With such a dam the country would be a large sea, dotted with islands for a great distance each side of the river; and, leaving evaporation out of the question, there would not be water enough from the whole watershed (in all probability) to accomplish such a result. Of course, the exact extent of such flowage can only be ascertained by further difficult and expensive surveys.

But, further, the evaporation over such a vastly increased area would be the source of an immense loss, not less than 25 inches probably, over its whole extent, while in the case of the proposed reservoirs the overflowed *surface* (see large map) is but little increased, while the *depth* is largely so. The increase of loss by evaporation is, therefore, so small as to be of no moment. (See reports.)

And, further, the damages to property that would be caused by such an overflow would be large. The lands along the river and its tributaries are owned to a large extent by lumbermen, who carry on an extensive business. Many of their pine lands would be overflowed, and whether the timber on them had been cut off or not, they would be sure to claim large damages. Their meadows would be entirely destroyed. In fact, any interest, Indian or otherwise, near the river or its tributaries, would be completely ruined, while under our system but little damage would ensue, and none whatever to any timber lands.

The above are some of the objections to a high dam at Pokegama Falls, were it practicable, and they seem to me to be unanswerable.

The final report, to which this is preliminary, with full estimates for dams, and which there has been no time to make up, will be submitted later.

Respectfully submitting the above, I am,

Very respectfully, your obedient servant,

JAMES D. SKINNER,
*Assistant Engineer.*

Maj. CHAS. J. ALLEN,
*Captain, Corps of Engineers, U. S. A.*

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*Discharges of the Mississippi and Leech Lake Rivers.*

| Date. | Station. | Height above low water. | Area of cross-section. | Mean velocity of river. | Discharge in cubic feet per second. | Average. |
|---|---|---|---|---|---|---|
| 1874. | | | | | | |
| Sept. 8 | Above Cass Lake | Mean high water | 482 | 1.074 | 517.0 | |
| Aug. 22 | Below Cass Lake | 1.855 | 443 | 2.012 | 891.0 | |
| 15 | First station, Leech Lake River | 1.536 | 544 | 1.121 | 610.0 | |
| Sept. 26 | Second station, Leech Lake River | Mean high water | 1,427 | 0.833 | 1,239.0 | |
| | Mississippi River below junction with Leech River. | 3.901 | 1,197 | 1.636 | 1,958.0 | |
| Oct. 12 | Above Pokegama Falls | 2.561 | 849 | 2.914 | 2,474.0 | |
| 15 | Below Grand Rapids | Mean high water | 731 | 3.454 | 2,525.0 | |
| 20 | Below Swan River | do | 1,513 | 1.963 | 2,969.0 | |
| 27 | Below Sandy Lake River | do | 1,738 | 1.696 | 2,946.0 | |
| Nov. 3 | Below Willow River | do | 1,822 | 2.077 | 3,784.0 | |
| 1878. | | | | | | |
| Oct. 14 | Below Lake Winnibigoshish | Mean low water. | 561 | 0.965 | 541.0 | |
| 16 | do | | 678 | 0.808 | 548.0 | |

*Discharges of the Mississippi and Leech Lake Rivers*—Continued.

| Date. | Station. | Height above low water. | Area of cross-section. | Mean velocity of river. | Discharge in cubic feet per second. | Average. |
|---|---|---|---|---|---|---|
| 1878. | | | | | | |
| Sept. 21 | First station, Leech Lake River | | 415 | 0.729 | 303.0 | |
| 23 | ....do | | 474 | 0.605 | 226.0 | |
| Oct. 21 | Above junction Leech River | | 342 | 1.821 | 622.0 | |
| | Below junction Leech River | | 672 | 1.354 | 909.0 | |
| 26 | Below Vermillion River | | 986 | 0.936 | 922.0 | |
| 1879. | | | | | | |
| | Below Grand Rapids: | | | | | |
| Oct. 15 | First observation | 0.4 below mean low water. | 853.3 | 1.161 | 941.0 | |
| | Second observation | ....do | 853.3 | 1.249 | 1,011.0 | 969.0 |
| | Third observation | ....do | 853.3 | 1.221 | 990.0 | |
| | Fourth observation | ....do | 853.3 | 1.151 | 934.0 | |
| | Below Sandy Lake River: | | | | | |
| Oct. 18 | First observation | 0.3 below mean low water. | 938.6 | 1.149 | 1,078.0 | |
| | Second observation | ....do | 938.6 | 1.267 | 1,190.0 | 1159.0 |
| | Third observation | ....do | 938.6 | 1.288 | 1,209.0 | |
| | At Aitkin, Minn.: | | | | | |
| Oct. 20 | First observation | 0.2 below mean low water. | 996.7 | 1.738 | 1,732.0 | |
| | Second observation | ....do | 996.7 | 1.748 | 1,742.0 | 1743.0 |
| | Third observation | ....do | 996.7 | 1.738 | 1,732.0 | |
| | Fourth observation | ....do | 996.7 | 1.772 | 1,766.0 | |

*Monthly rainfall from September* 1, 1878, *to September* 1, 1879, *with total for year, at Leech Lake, White Earth, Red Lake, and Saint Paul, Minn.*

| | 1878. | | | | 1879. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | July. | August. | Total yearly. |
| Leech Lake, Minn. | 2.18 | 4.00 | 0.20 | 0.30 | 0.00 | 0.00 | 1.60 | 0.70 | 5.15 | 4.50 | 3.81 | 2.05 | 24.49 |
| Red Lake, Minn ... | 3.28 | 1.95 | 0.06 | 0.95 | 0.50 | 1.10 | 0.42 | 0.96 | 2.19 | 4.63 | 3.23 | 2.20 | 21.47 |
| White Earth, Minn | 2.23 | 1.75 | 1.03 | 0.54 | 0.10 | 0.51 | 0.42 | 1.08 | 1.86 | 6.97 | 7.08 | 6.60 | 30.17 |
| Saint Paul, Minn .. | 2.13 | 1.85 | 0.61 | 1.04 | 0.11 | 1.12 | 0.97 | 0.45 | 7.18 | 1.76 | 9.32 | 2.78 | 29.32 |
| Monthly mean..... | 2.46 | 2.39 | 0.47 | 0.71 | 0.18 | 0.68 | 0.85 | 0.80 | 4.10 | 4.47 | 5.86 | 3.41 | ..... |

Mean yearly rainfall, 26.36.

*Monthly rainfall at Breckenridge, Minn., from January* 1, 1877, *to November* 28, 1879, *inclusive.*

| | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1877 ..... | 0.03 | 0.01 | 0.30 | 2.08 | 2.81 | 7.44 | 6.54 | 3.36 | 2.50 | 2.85 | 0.29 | 1.17 | 29.38 |
| 1878 ..... | 0.06 | 0.18 | 4.07 | 7.77 | 2.77 | 7.01 | 3.82 | 3.83 | 1.49 | 3.18 | 1.38 | 0.16 | 35.72 |
| 1879 ..... | 0.05 | 0.40 | 0.25 | 1.04 | 5.42 | 2.68 | 3.78 | 2.04 | 2.36 | 0.79 | *0.29 | ..... | ..... |

*During the first 28 days.

*Monthly rainfall from January to November, 1879, inclusive, at Saint Paul, Duluth, and Fort Snelling, Minn.*

| 1879. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | Total for 11 months. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Saint Paul, Minn | 0.11 | 1.12 | 0.97 | 0.45 | 7.18 | 1.76 | 9.32 | 2.78 | 2.26 | 2.56 | 1.41 | 29.92 |
| Duluth, Minn | 0.72 | 1.46 | 1.91 | 0.90 | 7.99 | 5.57 | 10.42 | 1.58 | 5.24 | 3.95 | 1.65 | 41.39 |
| Fort Snelling, Minn | 0.17 | 2.36 | 1.20 | 0.64 | 7.82 | 2.45 | 9.71 | 2.42 | 1.58 | 3.48 | 2.25 | 34.08 |

*Monthly rainfall at Duluth, Minn., during the year 1878.*

| | Inches. | | Inches. |
|---|---|---|---|
| January | 0.55 | September | 4.68 |
| February | 0.32 | October | 3.55 |
| March | 1.34 | November | 0.69 |
| April | 5.18 | December | 1.09 |
| May | 2.83 | | |
| June | 4.81 | Total yearly | 28.09 |
| July | 2.53 | | |
| August | 0.52 | Monthly average | 2.34 |

*Monthly rainfall from September 1, 1878, to November 30, 1879, at Leech Lake, Red Lake, White Earth, and Saint Paul, Minn.*

| | 1878. | | | | 1879. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | September. | October. | November. | December. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. |
| Leech Lake, Minn | 2.18 | 4.00 | 0.20 | 0.30 | 0.00 | 0.00 | 1.60 | 0.70 | 5.15 | 4.50 | 3.81 | 2.05 | 2.18 | 2.35 | 0.25 |
| Red Lake, Minn | 3.28 | 1.95 | 0.06 | 0.95 | 0.50 | 1.10 | 0.42 | 0.96 | 2.19 | 4.63 | 3.23 | 2.20 | 0.89 | 2.19 | 0.18 |
| White Earth, Minn | 2.23 | 1.75 | 1.03 | 0.54 | 0.10 | 0.51 | 0.42 | 1.08 | 1.86 | 6.97 | 7.08 | 6.60 | 1.61 | 7.08 | 0.34 |
| Saint Paul, Minn | 2.13 | 1.85 | 0.61 | 1.04 | 0.11 | 1.12 | 0.97 | 0.45 | 7.18 | 1.76 | 9.32 | 2.78 | 2.26 | 2.56 | 1.41 |

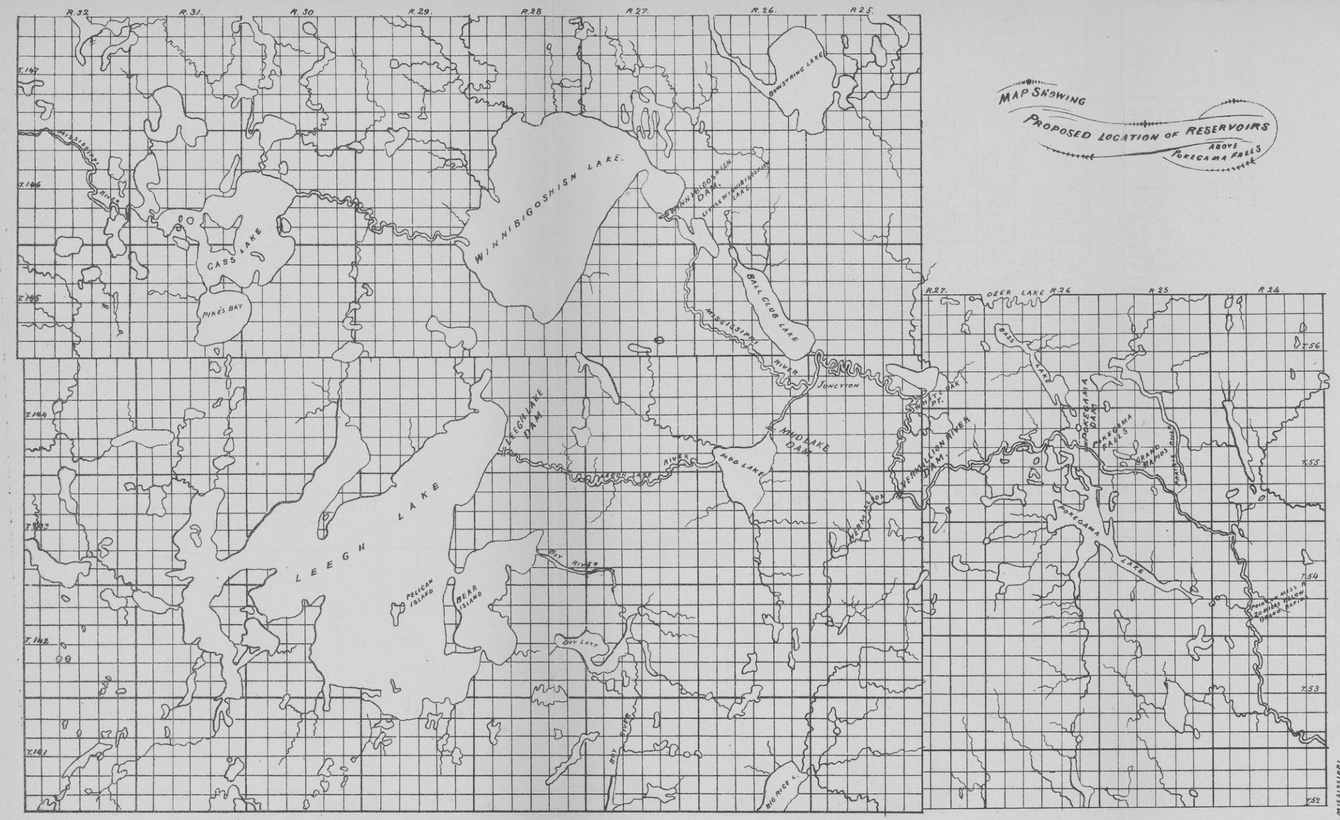
*Daily mean of evaporation.*

| 1879. | April. | May. | June. | July. | August. | September. | October. | Total daily mean. |
|---|---|---|---|---|---|---|---|---|
| White Earth, Minn | 0.209 | 0.199 | 0.274 | 0.184 | 0.239 | 0.158 | 0.160 | .203 |
| Red Lake, Minn | ..... | 0.146 | 0.215 | 0.224 | 0.150 | 0.128 | 0.098 | .160 |
| Leech Lake, Minn | 0.125 | 0.127 | 0.152 | 0.160 | 0.120 | 0.093 | 0.094 | .124 |
| Wausau, Wis | ..... | ..... | ..... | 0.161 | 0.145 | 0.125 | 0.065 | .124 |
| Trout Brook, Wis | ..... | ..... | ..... | 0.202 | 0.161 | 0.100 | 0.086 | .137 |

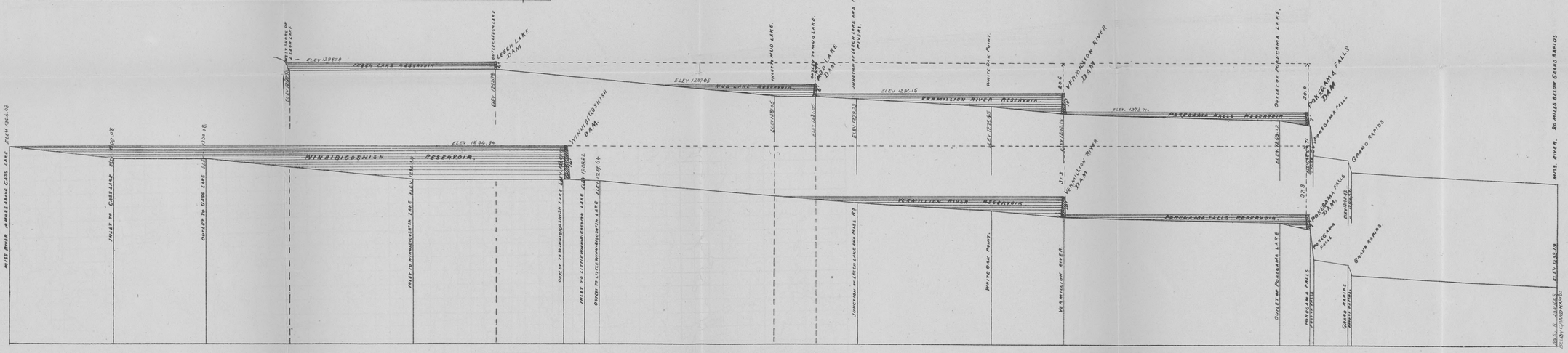
*Observations to determine coefficient to apply to exposed evaporating pans.*

| 1879. | September. | | | October. | | | November. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Sun pan. | Marsh pan. | Shade pan. | Sun pan. | Marsh pan. | Shade pan. | Sun pan. | Marsh pan. | Shade pan. |
| Saint Paul, Minn | 0.195 | 0.164 | 0.134 | 0.192 | 0.132 | 0.125 | 0.089 | 0.076 | 0.064 |

Average evaporation in sun = 0.159 inches.
Average evaporation in marsh = 0.124 inches.
0.124 ÷ 0.159 = 0.78 = coefficient.




MAP SHOWING
PROPOSED LOCATION OF RESERVOIRS
ABOVE
POKEGAMA FALLS




House. Ex. Doc. No. 39.

PROFILE OF THE MISSISSIPPI AND LEECH LAKE RIVERS, ABOVE POKEGAMA FALLS. SHOWING LOCATION OF RESERVOIRS.

# Map showing proposed reservoirs at the Sources of the Mississippi, St Croix, Chippewa and Wisconsin Rivers,

from Surveys and Compilations made during 1878 and 1879, under direction of Captain C. J. Allen, Corps of Engineers

## Sources of the Mississippi

| Name of reservoir | Capacity Cubic feet | Area of Watershed Square feet | Supply from Watershed ½ annual rainfall Cubic feet | ½ annual rainfall Cubic feet |
|---|---|---|---|---|
| Winnebigoshish | 46,734,204,380 | 52,745,952,300 | 36,922,132,960 | |
| Leech Lake | 22,567,564,800 | 27,906,278,400 | 12,534,394,880 | |
| Mud " | 2,855,414,400 | 4,180,544,000 | 3,122,580,800 | |
| Vermillion | 5,770,329,800 | 12,071,534,800 | 8,449,342,760 | |
| Pokegama | 3,751,791,456 | 4,390,223,600 | 3,493,156,520 | |
| Gull Lake | 6,133,548,000 | 7,582,924,800 | 5,285,920,000 | |
| Pine River | 4,515,000,000 | 15,360,398,400 | 10,667,555,760 | |

## Sources of the St Croix

| | | | | |
|---|---|---|---|---|
| Mud Lake | 396,377,420 | 766,656,000 | 536,659,200 | |
| Trice " | 2,474,344,500 | 3,749,644,800 | 2,624,751,360 | 2,348,476,416 |
| Yellow River | 3,608,712,000 | 4,446,608,800 | 3,112,625,360 | 2,312,254,496 |
| Veazies | 1,372,393,650 | 12,154,288,400 | 8,508,487,680 | 6,320,590,848 |
| Mouth of Totogatic | 3,082,033,820 | 5,910,220,800 | 4,137,154,560 | 3,073,314,816 |
| Upper " | 1,388,604,680 | 1,983,722,400 | 1,388,605,680 | 1,031,535,648 |
| Gilmore Lake | 2,881,095,000 | 7,316,149,600 | 5,051,308,720 | 3,752,397,792 |
| Mouth of Totogatic | 1,581,016,900 | 1,644,825,600 | 1,151,377,920 | 855,309,312 |
| Eau Claire Lakes | 961,085,400 | 1,979,366,400 | 1,385,536,480 | |
| Upper St Croix | 4,635,269,800 | 6,105,362,600 | 4,273,753,720 | 4,204,062,720 |
| Clam Lake | 4,670,786,500 | 7,903,326,400 | 5,532,428,480 | 4,102,835,328 |
| Lower St Croix | 2,702,600,000 | 28,748,752,000 | 20,100,326,400 | 14,931,671,040 |
| Ground House | 1,045,440,000 | 3,255,824,400 | 2,263,726,080 | 1,681,625,088 |
| Chengwatana | 5,703,258,000 | 24,132,634,400 | 16,829,886,080 | 12,554,201,088 |

## Sources of the Chippewa

| | | | | |
|---|---|---|---|---|
| Bear Lake | 1,113,148,856 | 6,816,768,800 | 5,677,251,240 | 4,260,168,000 |
| Little Chief Lake | 771,332,000 | 1,605,925,880 | 1,337,627,035 | 1,003,622,400 |
| Moose Lake | 2,021,783,402 | 5,374,344,120 | 4,276,626,163 | 3,433,963,200 |
| Pa-kwa-wang | 6,193,652,598 | 7,470,324,480 | 5,972,880,292 | 4,481,432,800 |
| Courts Oreilles | 1,386,356,000 | 3,178,137,600 | 2,647,388,621 | 1,986,356,000 |
| Paint Creek | 505,336,720 | 102,927,319,040 | 84,568,456,760 | 68,703,574,400 |
| Butternut Lake | 585,446,400 | 1,115,436,000 | 928,908,288 | 696,960,000 |
| Rest " | 1,240,000,000 | 5,900,120,800 | 4,897,100,264 | 3,687,615,360 |
| Bear Creek | 5,406,564,152 | 4,307,212,800 | 3,107,280,000 | 2,430,846,000 |
| Round Lake | 1,305,036,416 | 1,746,339,200 | 1,382,508,000 | 1,037,036,000 |
| Squaw " | 751,803,000 | 1,087,257,600 | 864,230,400 | 658,627,200 |
| Park " | 620,782,720 | 4,830,841,600 | 4,026,198,428 | 3,031,775,000 |

## Sources of the Wisconsin

| | | | | |
|---|---|---|---|---|
| Pelican | 5,153,180,324 | 8,391,398,400 | 6,836,526,800 | 5,166,506,400 |
| Sugar Camp | 1,354,284,160 | 1,672,704,000 | 1,335,840,000 | 1,016,400,000 |
| Oller Rapids | 7,389,727,488 | 12,461,644,800 | 10,027,628,160 | 7,609,990,080 |
| Tomahawk | 2,226,113,036 | 2,829,687,800 | 2,201,580,480 | 1,690,302,240 |
| Squirrel | 1,338,165,200 | 1,561,130,400 | 1,239,427,200 | 944,961,600 |
| Rice | 1,043,516,580 | 11,039,836,400 | 8,150,176,000 | 6,565,056,000 |
| Vieux Desert | 400,000,000 | 529,689,600 | 560,096,000 | 280,400,000 |
| Trin Lakes | 650,000,000 | 856,352,000 | 621,456,000 | 483,268,000 |

NOTE.

Heavy continuous black lines, drawn between sources of streams, denote boundaries of Watersheds. Figures in brackets, denote elevations above Sea level. † in table refers to alternate dams.

House. Ex. Doc No. 39

*Table of lands liable to be overflowed by the construction of reservoirs at the sources of the Mississippi River.*

ABOVE POKEGAMA FALLS.

| Overflowed lands. | | | Portions of overflowed lands transferred by United States Government— | |
|---|---|---|---|---|
| Range. | Township. | Section. | To State of Minnesota (swamp lands). | To private parties. |
| 25 W. 5th M.. | 143 | 1 | N. ½ NE. ¼, SW. ¼ NE. ¼, N. ½ SW. ¼, S. ½ NW. ¼. | |
| | 143 | 11 | Lots 1, 3 | |
| | 143 | 12 | Lots 1, 2, 4, 5, 6, 7, 8, NE. ¼ SE. ¼ | |
| | 143 | 13 | SE. ¼, S. ½ SW. ¼, lot 1 | |
| | 144 | 25 | Lots 6, 7, 12, 13, 14 | |
| | 144 | 34 | SW. ¼, W. ½ SE. ¼, S. ½ NW. ¼, NE. ¼ NW. ¼, SW. ¼ NE. ¼. | |
| 27 W. 4th M.. | 54 | 3 | Lot 7 | N. ½ SE. ¼, NE. ¼ SW. ¼, lots 5, 7. |
| | 54 | 4 | Lots 3, 4 | |
| | 55 | 13 | | Lot 7. |
| | 55 | 14 | | Lot 2. |
| | 55 | 15 | S. ½ SW. ¼, SW. ¼ SE. ¼ | |
| | 55 | 16 | | |
| | 55 | 21 | Lot 1 | |
| | 55 | 22 | N. ½ NW. ¼, NW. ¼ NE. ¼, lot 7 | |
| | 55 | 23 | Lots 4, 5, 8 | NW. ¼ SW. ¼, SW. ¼, NW. ¼, lot 7. |
| | 55 | 24 | SE. ¼, lot 4 | |
| | 55 | 25 | | W. ½ SW. ¼, SE. ¼ SW. ¼. |
| | 55 | 27 | NE. ¼ NE. ¼, lot 2 | |
| | 55 | 28 | Lots 1, 3, 4, 6 | |
| | 55 | 33 | | |
| | 55 | 34 | Lot 6 | Lot 5. |
| | 55 | 35 | SE. ¼ NE. ¼, S. ½ SW. ¼ | SE. ¼, W. ½ NE. ¼, NE. ¼ NE. ¼, NE. ¼ NW. ¼, lots 1, 2. |
| | 55 | 36 | | |
| | 56 | 21 | Lots 1, 2, 3, E. ½ NE. ¼ | |
| | 56 | 22 | Whole fract. section | |
| 26 W. 4th M.. | 55 | 1 | | SW. ¼ NE. ¼, NW. ¼ SW. ¼, lots 3, 4. |
| | 55 | 2 | Lots 8, 9 | All entered. |
| | 55 | 7 | Lot 9 | S. ½ NW. ¼, SE. ½, NE. ¼, N. ½ SE. ¼, lot 4. |
| | 55 | 8 | Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 | NW. ¼ SW. ¼. |
| | 55 | 9 | N. ½ NE. ¼, E. ½ NW. ¼, lots 4, 9, 8, 10, 11. | |
| | 55 | 10 | | Lot 8. |
| | 55 | 11 | | N. ½ SE. ¼, lot 1. |
| | 55 | 12 | | S. ½ SE. ¼, N. ½ SW. ¼, S. ½ NW. ¼, SE. ¼ NE. ¼. |
| | 55 | 13 | | N. ½, NW. ¼ SW. ¼, lot 7. |
| | 55 | 14 | | E. ½ NE. ¼, NE. ¼ SE. ¼, lots 9, 13. |
| | 55 | 15 | Lots 7, 9, 10 | NE. ¼ NE. ¼, W. ½ SW. ¼, lots 1, 3, 4, 8. |
| | 55 | 16 | | |
| | 55 | 17 | S. ½ SE. ¼, lots 4, 5 | NE. ¼ SW. ¼, lots 7, 8. |
| | 55 | 18 | Lots 8, 9, 10, 11, 12 | NE. ¼ SE. ¼, E. ½ SW. ¼, lots 1, 2, 3, 7, 13. |
| | 55 | 19 | | S. ½, S. ½ NE. ¼. |
| | 55 | 28 | | E. ½ SE. ¼, SW. ¼ SE. ¼, S. ½ NE. ¼, lots 2, 3. |
| | 55 | 29 | | Lots 2, 3, 8. |
| | 55 | 30 | | NE. ¼, NE. ¼ NW. ¼, lot 5. |
| | 55 | 31 | NE. ¼ NE. ¼ | S. ½, SE. ¼ NW. ¼, lot 2. |
| | 55 | 32 | SW. ¼ NW. ¼ | SE. ¼, S. ½ NE. ¼, NW. ¼ NW. ¼, E. ½ SW. ¼, lot 2. |
| | 55 | 33 | W. ½ NE. ¼, NE. ¼ NW. ¼, lot 2 | NE. ¼ NE. ¼, N. ½ SE. ¼, N. ½ SW. ¼, SW ¼ SW. ¼, SW. ¼ NW. ¼. |
| | 55 | 34 | Lots 3, 8 | NW. ¼ NW. ¼. |
| 32 W. 5th M.. | 144 | 11 | NE. ¼ NW. ¼ | |
| | 144 | 13 | | |
| | 144 | 14 | | |
| | 144 | 20 | NE. ¼ NE. ¼, SE. ¼ NW. ¼, NE. ¼ SW. ¼, lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. | W. ½ NW. ¼. |
| | 144 | 21 | NW. ¼ NW. ¼, S. ½ SW. ¼ | SE. ¼ NE. ¼, NE. ¼ SE. ¼. |
| | 144 | 24 | | 1 lot containing $3\frac{28}{110}$ acres. |
| | 144 | 25 | Lot 2 | |
| | 144 | 26 | Lots 1, 3, 4, 5, 6, 7, 8, 9, 10 | |
| | 144 | 27 | | |
| | 144 | 28 | Lots 1, 2, 4, 5, 6, 7 | |
| | 144 | 29 | Lots 1, 3, SE. ½ NW. ¼, SW. ¼ | |
| | 144 | 33 | Lots 1, 5, 6 | |
| | 144 | 34 | Lots 1, 2, 4, 6, 7 | |
| | 144 | 35 | Lots 1, 2, 3 | |
| | 143 | 1 | | |
| | 143 | 34 | S. ½ SE. ¼, NE. ¼ SE. ¼ | |
| | 143 | 35 | S. ½ SE. ¼, S. ½ SW. ¼, NW. ¼ SW. ¼, NE. ¼ SE. ¼, SW. ¼ NE. ¼, NW. ¼ N. W. ¼. | |

*Table of lands liable to be overflowed by the construction of reservoirs, &c.*—Continued.

ABOVE POKEGAMA FALLS—Continued.

| Overflowed lands. | | | Portions of overflowed lands transferred by United States Government— | |
|---|---|---|---|---|
| Range. | Township. | Section. | To State of Minnesota (swamp lands). | To private parties. |
| 32 W. 5th M.. | 143 | 36 | | |
| | 142 | 1 | Lots 2, 3, 10 | |
| | 142 | 2 | Lots 5, 10 | |
| | 142 | 3 | Lots 5, 6 | W. ½ SE. ¼, E. ½ SW. ¼, SE. ¼ SE. ¼. |
| | 142 | 11 | SE. ¼ SE. ¼ | |
| | 142 | 12 | SW. ¼, SW. ¼ NW. ¼, lot 3 | |
| | 142 | 13 | | |
| | 142 | 14 | | |
| **CROSS LAKE DAM.** | | | | |
| 27 W. 5th M.. | 138 | 31 | | |
| | 138 | 32 | | SE. ¼, NE. ¼ NE. ¼, lots 2, 3. |
| 28 W. 5th M.. | 138 | 35 | NE. ¼, E. ½ SE. ¼ | W. ½ SE. ¼, E. ½ SW. ¼, SW. ¼ SW. ¼. |
| | 138 | 36 | | |
| 27 W. 5th M.. | 137 | 6 | | SW. ¼ NE. ¼, lots 1, 2, 3, 4, 5. |
| | 137 | 7 | | Lots 7, 9. |
| | 137 | 8 | | Lots 2, 4. |
| | 137 | 9 | | NE. ¼ NE. ¼, SE. ¼ SW. ¼. |
| | 137 | 11 | | N. ½ NE. ¼. |
| | 137 | 15 | NE. ¼ NW. ¼, lot 1 | E. ½, E. ½ SW. ¼, S. ½ NE. ¼, NW. ¼ SW. ¼. |
| | 137 | 16 | | |
| | 137 | 17 | | |
| | 137 | 18 | | Lot 7. |
| | 137 | 19 | | SE. ¼ SW. ¼. |
| | 137 | 20 | | Lot 2. |
| | 137 | 21 | | N. ½ NE. ¼, NE. ¼ NW. ¼ |
| | 137 | 29 | | |
| 28 W. 5th M.. | 137 | 1 | | Lots 1, 2, 3. |
| | 137 | 2 | | NE. ¼, N. ½, SE. ¼, lots 3, 5. |
| | 137 | 4 | | |
| | 137 | 5 | | |
| | 137 | 6 | | |
| | 137 | 7 | | |
| | 137 | 9 | | Lot 1. |
| | 137 | 10 | | Lot 4. |
| | 137 | 11 | | |
| | 137 | 12 | | |
| | 137 | 13 | | |
| | 137 | 14 | | |
| | 137 | 15 | | |
| | 137 | 16 | | |
| | 137 | 17 | | |
| | 137 | 18 | | |
| | 137 | 19 | | SW. ¼ SE. ¼, lots 4, 7. |
| | 137 | 20 | | NW. ¼. |
| | 137 | 21 | SE. ¼, SW. ¼ NE. ¼, lots 1, 2 | |
| | 137 | 22 | | E. ½. |
| | 137 | 30 | | E. ¼ SE. ¼. |
| 29 W. 5th M.. | 137 | 12 | | |
| | 137 | 13 | | |
| | 137 | 24 | | |
| | 137 | 25 | | |
| **GUTT LAKE DAM.** | | | | |
| 28 W. 5th M . | 136 | 30 | Lots 2, 3, 4 | NE. ¼ NE. ¼. |
| | 136 | 31 | | |
| 29 W. 5th M . | 136 | 36 | | |
| 28 W. 5th M . | 135 | 7 | | |
| | 135 | 8 | | |
| | 135 | 17 | | |
| | 135 | 18 | | Lots 3, 5, 6, 7. |
| | 135 | 19 | | |
| | 135 | 20 | | N. ½ NW. ¼. |
| | 135 | 29 | | |
| | 135 | 30 | | Lots 2, 3. |
| | 135 | 31 | | |
| | 135 | 32 | SW. ¼ SW. ¼ | |
| | 135 | 33 | | |
| | 135 | 34 | | |
| | 135 | 35 | | |

*Table of lands liable to be overflowed by the construction of reservoirs, &c.*—Continued.

GUTT LAKE DAM—Continued.

| Overflowed lands. | | | Portions of overflowed lands transferred by United States Government— | |
|---|---|---|---|---|
| Range. | Township. | Section. | To State of Minnesota (swamp lands. | To private parties. |
| 29 W. 5th M. | 135 | 1 | | |
| | 135 | 2 | | |
| | 135 | 3 | | |
| | 135 | 4 | | NW. ¼ NE. ¼. |
| | 135 | 5 | | |
| | 135 | 6 | | |
| | 135 | 7 | | E. ½ SE. ¼, E. ½ NE. ¼. |
| | 135 | 8 | | S. ½ SW. ¼. |
| | 135 | 9 | Lots 1, 2 | |
| | 135 | 10 | | |
| | 135 | 11 | Lot 7 | |
| | 135 | 12 | W. ½ NE. ¼ | Lots 1, 6. |
| | 135 | 13 | SW. ¼ SW. ¼ | |
| | 135 | 14 | | SE. ¼ SE. ¼. |
| | 135 | 15 | S. ½ NE. ¼, fractional S. ½, lots 2, 5, 6. | |
| | 135 | 16 | | |
| | 135 | 17 | | N. ½ NW. ¼. |
| | 135 | 20 | | Lots 1, 2, 3, 4, 5. |
| | 135 | 21 | Lots 2, 3 | |
| | 135 | 22 | | |
| | 135 | 23 | Lot 1 | |
| | 135 | 24 | NW. ¼ NW. ¼, NW. ¼ SW. ¼ | Lot 3. |
| | 135 | 25 | | |
| | 135 | 26 | | Lots 1, 2, 3, 4, 5, 6, 7. |
| | 135 | 29 | | |
| | 135 | 30 | S. ½ SE. ¼, NE. ¼ SE. ¼ | |
| | 135 | 31 | | |
| | 135 | 32 | | W. ½ SE. ¼. |
| | 135 | 33 | | |
| | 135 | 34 | | E. ½ SE. ¼, lots 1, 2, 3, 4. |
| | 135 | 35 | | Lots 1, 2, 3, 4, 6. |
| | 135 | 36 | | |
| 28 W. 5th M. | 134 | 2 | | |
| | 134 | 3 | | |
| | 134 | 4 | | |
| | 134 | 5 | Lots 1, 2 | |
| | 134 | 6 | | SE. ¼ NW. ¼, NW. ¼ NE. ¼, lots 1, 2, 3 4, 5. |
| | 134 | 9 | | |
| | 134 | 16 | | |
| | 134 | 17 | | |
| | 134 | 18 | | |
| | 134 | 19 | | |
| | 134 | 20 | S. ½ NE. ¼, NE. ¼ NE. ¼, S. ½ SW. ¼, NE. ¼ SW. ¼. | |
| 29 W. 5th M. | 134 | 1 | | Lots 1, 2, 3, 4, 5, 6, 7. |
| | 134 | 2 | | W. ½ SW. ¼, lots 1, 2, 3, 4, 5 6 |
| | 134 | 3 | | Lots 1, 2. |
| | 134 | 4 | | |
| | 134 | 7 | | |
| | 134 | 8 | | |
| | 134 | 9 | | |
| | 134 | 10 | | |
| | 134 | 11 | Lot 1 | |
| | 134 | 12 | | Lot 1. |
| | 134 | 13 | | |
| | 134 | 14 | | Lot 6. |
| | 134 | 16 | | |
| | 134 | 17 | | |
| | 134 | 18 | | |
| | 134 | 19 | | |
| | 134 | 20 | | |
| | 134 | 29 | | |
| | 134 | 30 | | |
| 30 W. 5th M. | 134 | 13 | | |
| | 134 | 23 | | |
| | 134 | 24 | | |
| | 134 | 25 | | |
| | 134 | 26 | | |

*Indian lands in Chippewa (Leech Lake) Reservation liable to be overflowed.*

| Range. | Township. | Section. | Range. | Township. | Section. | Range. | Township. | Section. |
|---|---|---|---|---|---|---|---|---|
| 27 W. 4th M ..... | 56 | 16 | 26 W. 5th M ..... | 144 | 14 | 27 W. 5th M ..... | 143 | 28 |
| | 56 | 21 | | 144 | 22 | | 143 | 29 |
| | 56 | 22 | | 144 | 23 | | 143 | 30 |
| | 56 | 26 | | 144 | 26 | | 143 | 31 |
| | 56 | 27 | | 144 | 27 | | 143 | 32 |
| | 56 | 28 | | 144 | 28 | | 143 | 33 |
| | 56 | 33 | | 144 | 29 | | 143 | 34 |
| | 56 | 34 | | 144 | 30 | | 143 | 35 |
| | 55 | 2 | | 144 | 31 | | 142 | 2 |
| | 55 | 3 | | 144 | 32 | | 142 | 3 |
| | 55 | 4 | | 144 | 33 | | 142 | 4 |
| | 55 | 9 | | 144 | 34 | | 142 | 5 |
| | 55 | 10 | | 144 | 35 | | 142 | 8 |
| | 55 | 11 | 27 W. 5th M..... | 147 | 26 | | 142 | 9 |
| | 55 | 15 | | 147 | 29 | | 142 | 10 |
| | 55 | 16 | | 147 | 30 | | 142 | 11 |
| | 55 | 21 | | 147 | 31 | | 142 | 12 |
| | 55 | 22 | | 147 | 32 | | 142 | 14 |
| 25 W. 5th M ..... | 145 | 30 | | 147 | 33 | | 142 | 15 |
| | 145 | 31 | | 146 | 2 | | 142 | 16 |
| | 145 | 32 | | 146 | 3 | | 142 | 18 |
| | 145 | 33 | | 146 | 4 | | 142 | 21 |
| | 145 | 34 | | 146 | 10 | | 142 | 22 |
| | 145 | 35 | | 146 | 11 | | 142 | 28 |
| | 145 | 36 | | 146 | 13 | | 142 | 30 |
| | 144 | 1 | | 146 | 14 | | 142 | 31 |
| | 144 | 2 | | 146 | 15 | | 142 | 32 |
| | 144 | 3 | | 146 | 16 | | 142 | 33 |
| | 144 | 4 | | 146 | 20 | 28 W. 5th M..... | 147 | 11 |
| | 144 | 5 | | 146 | 21 | | 147 | 14 |
| | 144 | 6 | | 146 | 22 | | 147 | 17 |
| | 144 | 9 | | 146 | 24 | | 147 | 18 |
| | 144 | 10 | | 146 | 25 | | 147 | 19 |
| | 144 | 11 | | 146 | 26 | | 147 | 23 |
| | 144 | 12 | | 146 | 27 | | 147 | 24 |
| | 144 | 13 | | 146 | 28 | | 147 | 25 |
| | 144 | 14 | | 146 | 29 | | 147 | 26 |
| | 144 | 15 | | 146 | 31 | | 147 | 28 |
| | 144 | 22 | | 146 | 36 | | 147 | 29 |
| | 144 | 23 | | 145 | 1 | | 147 | 30 |
| | 144 | 24 | | 145 | 6 | | 147 | 31 |
| | 144 | 25 | | 145 | 7 | | 147 | 32 |
| | 144 | 26 | | 145 | 8 | | 147 | 33 |
| | 144 | 35 | | 145 | 9 | | 147 | 34 |
| | 143 | 2 | | 145 | 12 | | 147 | 35 |
| | 143 | 11 | | 145 | 13 | | 147 | 36 |
| 26 W. 5th M ..... | 146 | 30 | | 145 | 16 | | 146 | 5 |
| | 146 | 31 | | 145 | 17 | | 146 | 6 |
| | 146 | 32 | | 145 | 18 | | 146 | 7 |
| | 145 | 4 | | 145 | 19 | | 146 | 8 |
| | 145 | 5 | | 145 | 20 | | 146 | 18 |
| | 145 | 6 | | 145 | 21 | | 146 | 19 |
| | 145 | 8 | | 145 | 24 | | 146 | 20 |
| | 145 | 9 | | 144 | 15 | | 145 | 7 |
| | 145 | 10 | | 144 | 16 | | 145 | 12 |
| | 145 | 14 | | 144 | 21 | | 145 | 13 |
| | 145 | 16 | | 144 | 22 | | 145 | 17 |
| | 145 | 19 | | 144 | 23 | | 145 | 18 |
| | 145 | 21 | | 144 | 25 | | 145 | 20 |
| | 145 | 22 | | 144 | 26 | | 145 | 21 |
| | 145 | 23 | | 144 | 27 | | 145 | 22 |
| | 145 | 24 | | 144 | 28 | | 145 | 23 |
| | 145 | 25 | | 144 | 29 | | 145 | 24 |
| | 145 | 27 | | 144 | 30 | | 145 | 26 |
| | 145 | 28 | | 144 | 31 | | 145 | 27 |
| | 145 | 29 | | 144 | 32 | | 145 | 29 |
| | 145 | 30 | | 144 | 33 | | 144 | 6 |
| | 145 | 33 | | 144 | 34 | | 144 | 7 |
| | 145 | 34 | | 144 | 35 | | 144 | 8 |
| | 145 | 35 | | 144 | 36 | | 144 | 16 |
| | 145 | 36 | | 143 | 1 | | 144 | 17 |
| | 144 | 1 | | 143 | 2 | | 144 | 18 |
| | 144 | 2 | | 143 | 3 | | 144 | 20 |
| | 144 | 3 | | 143 | 4 | | 144 | 21 |
| | 144 | 11 | | 143 | 5 | | 144 | 25 |
| | 144 | 12 | | 143 | 6 | | 144 | 26 |
| | 144 | 13 | | 143 | 9 | | 144 | 27 |

*Indian lands in Chippewa (Leech Lake) Reservation liable to be overflowed*—Continued.

| Range. | Township. | Section. | Range. | Township. | Section. | Range. | Township. | Section. |
|---|---|---|---|---|---|---|---|---|
| 28 W. 5th M | 144 | 28 | 29 W. 5th M | 146 | 32 | 30 W. 5th M | 143 | 9 |
| | 144 | 29 | | 146 | 33 | | 143 | 10 |
| | 144 | 31 | | 146 | 34 | | 143 | 11 |
| | 144 | 32 | | 146 | 35 | | 143 | 13 |
| | 144 | 33 | | 146 | 36 | | 143 | 31 |
| | 144 | 34 | | 145 | 1 | | 142 | 3 |
| | 144 | 35 | | 145 | 2 | | 142 | 9 |
| | 144 | 36 | | 145 | 11 | | 142 | 10 |
| | 143 | 1 | | 145 | 12 | | 142 | 15 |
| | 143 | 2 | | 144 | 1 | | 142 | 16 |
| | 143 | 4 | | 144 | 2 | | 142 | 20 |
| | 143 | 5 | | 144 | 12 | | 142 | 21 |
| | 143 | 6 | | 144 | 13 | | 142 | 22 |
| | 143 | 7 | | 144 | 23 | | 142 | 27 |
| | 143 | 8 | | 144 | 24 | | 142 | 28 |
| | 143 | 9 | | 144 | 27 | | 142 | 29 |
| | 143 | 13 | | 144 | 33 | 31 W. 5th M | 147 | 19 |
| | 143 | 14 | | 143 | 5 | | 147 | 20 |
| | 143 | 15 | | 143 | 6 | | 147 | 23 |
| | 143 | 16 | | 143 | 7 | | 147 | 24 |
| | 143 | 17 | | 143 | 11 | | 147 | 25 |
| | 143 | 18 | | 143 | 12 | | 147 | 29 |
| | 143 | 19 | | 143 | 13 | | 147 | 32 |
| | 143 | 20 | | 143 | 14 | | 147 | 36 |
| | 143 | 21 | | 143 | 23 | | 146 | 13 |
| | 143 | 22 | | 143 | 24 | | 146 | 21 |
| | 143 | 23 | | 142 | 24 | | 146 | 22 |
| | 143 | 24 | | 142 | 36 | | 146 | 24 |
| | 143 | 25 | | 141 | 1 | | 146 | 27 |
| | 143 | 26 | | 141 | 2 | | 146 | 29 |
| | 143 | 27 | | 141 | 3 | | 146 | 32 |
| | 143 | 30 | | 141 | 6 | | 146 | 33 |
| | 143 | 33 | | 141 | 7 | | 145 | 3 |
| | 143 | 34 | | 141 | 8 | | 145 | 10 |
| | 143 | 35 | | 141 | 17 | | 145 | 14 |
| | 143 | 36 | | 141 | 18 | | 145 | 15 |
| | 142 | 4 | 30 W. 5th M | 147 | 19 | | 145 | 22 |
| | 142 | 5 | | 147 | 20 | | 145 | 27 |
| | 142 | 8 | | 147 | 21 | | 144 | 15 |
| | 142 | 9 | | 147 | 22 | | 144 | 16 |
| | 142 | 13 | | 147 | 27 | | 144 | 19 |
| | 142 | 14 | | 147 | 30 | | 144 | 20 |
| | 142 | 15 | | 147 | 31 | | 144 | 21 |
| | 142 | 16 | | 147 | 32 | | 144 | 22 |
| | 142 | 17 | | 147 | 33 | | 144 | 28 |
| | 142 | 19 | | 147 | 34 | | 144 | 29 |
| | 142 | 21 | | 147 | 35 | | 144 | 32 |
| | 142 | 22 | | 146 | 2 | | 144 | 33 |
| | 142 | 23 | | 146 | 3 | | 143 | 2 |
| | 142 | 26 | | 146 | 4 | | 143 | 3 |
| | 142 | 27 | | 146 | 5 | | 143 | 4 |
| | 142 | 28 | | 146 | 17 | | 143 | 5 |
| | 142 | 29 | | 146 | 21 | | 143 | 6 |
| | 142 | 30 | | 146 | 22 | | 143 | 7 |
| 29 W 5th M | 147 | 24 | | 146 | 23 | | 143 | 8 |
| | 147 | 25 | | 146 | 24 | | 143 | 9 |
| | 147 | 36 | | 146 | 25 | | 143 | 10 |
| | 146 | 1 | | 144 | 11 | | 143 | 20 |
| | 146 | 11 | | 144 | 12 | | 143 | 22 |
| | 146 | 12 | | 144 | 13 | | 143 | 25 |
| | 146 | 13 | | 144 | 14 | | 143 | 33 |
| | 146 | 14 | | 144 | 23 | | 143 | 35 |
| | 146 | 24 | | 144 | 24 | | 143 | 36 |
| | 146 | 25 | | 144 | 26 | | 142 | 1 |
| | 146 | 26 | | 144 | 34 | | 142 | 2 |
| | 146 | 29 | | 143 | 1 | | 142 | 3 |
| | 146 | 30 | | 143 | 3 | | 142 | 4 |
| | 146 | 31 | | 143 | 8 | | 142 | 12 |

EXAMINATIONS AND SURVEYS AT HEADWATERS OF SAINT CROIX, CHIPPEWA, AND WISCONSIN RIVERS, WITH A VIEW TO FEASIBILITY, COST, &c., OF CONSTRUCTING AND MAINTAINING RESERVOIRS FOR THE IMPROVEMENT OF NAVIGATION OF THOSE STREAMS AND THE MISSISSIPPI RIVER, IN ACCORDANCE WITH ACTS OF CONGRESS OF JUNE 18, 1878, AND MARCH 3, 1879.

ENGINEER OFFICE UNITED STATES ARMY,
*Saint Paul, January* 15, 1880.

GENERAL: I have the honor to submit the following progress report of the examinations and surveys at the headwaters of the Saint Croix, Chippewa, and Wisconsin Rivers, made with a view to determining the feasibility, cost, &c., of constructing and maintaining reservoirs for the improvement of those streams and the Mississippi River, in accordance with the acts of Congress approved June 18, 1878, and March 3, 1879, and in continuation of my report of December 12, 1879.

Three parties were placed in the field last June, and they completed most of the necessary field-work by the middle of November.

The first party, under Assistant Vine D. Simar, chief of party, and Assistants R. Davenport and G. W. Carrington, was charged with the completion of the examinations at the sources of the Saint Croix River (Minnesota and Wisconsin), begun last year by the party under Assistant Treherne.

The second party, under Assistant Archibald Johnson, chief of party, and Assistants G. O. Foss and G. M. Willis, was charged with the necessary examinations and surveys of the East and West Forks of the Chippewa River, of the Courtes-Oreilles River and Lake, and, generally, of examinations as far down as Chippewa Falls on the Chippewa River.

To the third party, under Assistant James D. Reynolds, chief of the party, and Assistants W. S. Morton and J. D. Mason, was assigned the completion of the survey and examination of the headwaters of the Wisconsin River, begun late in 1878 by Assistant Charles Wanzer; and also the completion of the surveys of the North and South Forks of the Flambeau River, the main tributary to the Chippewa, begun in 1878 by Assistant J. H. Dager. These gentlemen have all acquitted themselves well of the duties with which they were charged, and are entitled to my thanks for the energy and zeal displayed by them.

These examinations were all similar in character to those described in my report of January 15, 1879, involving the running of flowage and contour lines, selection and surveys of dam-sites, lines of level connecting important points with the sea-level, gauging of streams at different stages whenever possible, the collection of information relating to property liable to be damaged by overflow, and all other information attainable bearing upon the subject in hand. Several meteorological stations were established early in the season, and, although the records to date do not cover an entire year, our stock of information as regards the rainfall of this region has been materially added to.

This report is intended to be taken in connection with my report of January 15 last.

## HEADWATERS OF THE SAINT CROIX RIVER.

The report of January 15, above alluded to, gives a general description of the Wisconsin watershed of the Saint Croix. The principal affluents from the Minnesota watershed are the Snake, Kettle, and Tama-

rac Rivers. From the Wisconsin side the principal affluents are the Eau-Claire, Totogatic, Namakagon, Yellow, and Clam rivers.

Preliminary to the operations this year, a line of levels was run from Rush City on the line of the Saint Paul and Duluth Railroad, starting from a point at a known elevation above Lake Superior and the sea, and carried to the bench-marks established last year at the upper Lake Saint Croix, and the Totogatic and Yellow rivers; thence up the Namakagon River to the Little Pak-wa-wanee, and thence across the country to the Totogatic bench-marks, checking at the end very closely.

The work accomplished was as follows:

On the main Saint Croix:

Selection and survey of a dam-site above the mouth of Kettle River and gauging the discharge of the stream.

On the tributaries:

Selections and surveys of dam-sites, as follows:

One site on the Eau Claire River.

Two sites on the Totogatic River.

Two sites on the Yellow River.*

Re-survey of Yellow Lake dam-site:

Surveys of two sites on the Namakagon River.

Survey of one site on the Clam River.

Surveys of two sites on the Snake River, in Minnesota.

Kettle and Tamarac rivers, in Minnesota, were also examined, but no available sites for dams were found.

All the streams were gauged more or less for discharge in the vicinity of each selected dam-site, in order to obtain not only an idea of the amount of water flowing per second, but also an idea of the proportion of the rain-fall that actually finds its way into the streams, after deducting the losses by evaporation, infiltration, absorption, &c.

The results obtained indicate that above one-third of the annual rainfall actually finds its way into the streams, and calculations, based upon one-third and also upon one-fourth of the rainfall, have been made, and are submitted in the accompanying tables. In the calculations it is assumed that the reservoirs will be closed from the latter part of November to the 30th of June, although it is not likely that it will be necessary to open their gates to the full capacity before the latter part of July. As the result of our investigations both in Wisconsin and Minnesota, the above-named factors are taken to represent that portion of the annual rainfall that can be stored, from the watersheds tributary to the reservoirs, in the reservoirs, between the close of November and the 1st of July following; and these factors are used generally in all the computations.

The conditions for storing water on the Saint Croix are more favorable than I expected. The surplus—understanding by this term the excess of the supply of water over the capacities of the reservoirs—is about 60 per cent. of the entire supply derived from the watershed tributary to the stream at a point just below the mouth of Snake River. We thus have about 60 per cent. of the entire supply above this point, besides the whole of that derived from the drainage area between the mouth of Snake River and Taylor's Falls, and the entire supply from a watershed of about 1,600 square miles below the falls, to meet the demands of the navigable stretch below Taylor's Falls, independently of the reservoirs.

*These were supplementary to the three sites selected and reported upon in my last report, and are designed to retain as much as possible of the surplus water mentioned in that report.

The dams found practicable from the surveys of this and last season are, if we assume one-third the rainfall for our factor:

1. At the outlet of the Eau Claire Lakes. A dam at this point, raised to a height of 12½ feet above low-water, with a reservoir capacity of 961,045,400 cubic feet, equal to 124 cubic feet of water per second for 90 days. To cost $9,635.79. The surplus is 424,511,080 cubic feet, which surplus is to be collected at some point below.

2. Below the Upper Lake Saint Croix, on the Saint Croix River, about 1 mile below what is known as the Big Dam. A dam at this point, raised to a height of 24½ feet above low-water surface, will afford a reservoir capacity of 4,698,269,800 cubic feet, a quantity of water equal to a flow of 604 cubic feet per second for 90 days, and will, in addition, take up the surplus from the Eau Claire Lakes. To cost $94,319.55.

3. On the Upper Totogatic, near the "Old Dam." A dam can be built here at a height of 12½ feet above low-water surface, affording a reservoir capacity of 1,388,605,680 cubic feet, representing a flow of 178 cubic feet per second for 90 days. No surplus. To cost $7,482.38.

4. Below Gilmore Lake, on the Totogatic River, a dam 30 feet in height will create a reservoir of 2,881,095,000 cubic feet capacity, representing a flow of 370 cubic feet per second for 90 days. The surplus from this reservoir is 2,170,209,720 cubic feet of water, to be retained at some other point. To cost $21,876.65.

5. On the Lower Namakagon, about 4 miles above its confluence with the Saint Croix River, a dam can be established to create a reservoir of 1,541,016,900 cubic feet capacity, representing 198 cubic feet per second for 90 days. (See No. 7.)

6. On the Namakagon, near Veazie's Ranche, a dam 31½ feet in height, reservoir capacity resulting 1,379,393,850 cubic feet, equal to 177 cubic feet per second for 90 days. To cost $32,762.75. The surplus at this point is 7,129,093,830 cubic feet.

7. On the Lower Namakagon, 1 mile below the confluence of the Totogatic with this stream, a dam 41 feet in height will create a reservoir, by ponding back into both the Totogatic and Namakagon Rivers, of 3,082,033,820 cubic feet capacity, equal to 396 cubic feet per second for 90 days. This dam has been alluded to as No. 5, when taken with reference to the Totogatic alone. It is here considered as forming the distributing-reservoir for the Totogatic and Namakagon systems, in which case its surplus is 1,055,120,740 cubic feet of water. To cost $43,610.45.

8. Mud Lake, on the Upper Yellow River. A dam 6 feet in height above low-water will create a reservoir of 396,377,420 cubic feet capacity, representing a flow of 51 cubic feet per second for 90 days. To cost $1,200. Surplus, 140,281,780 cubic feet. A sluicing-dam exists at this point, and the above estimate is simply for raising and repairing it.

9. On the Yellow River, below Rice Lakes, a dam 25½ feet in height above low-water, affording a reservoir capacity of 2,474,944,500 cubic feet, can be established, with surplus of 149,806,860 cubic feet. Flow per second for 90 days, 318 cubic feet. Dam to cost $33,266.70.

10. On the Yellow River, below Yellow Lake. A dam 20 feet in height, resulting reservoir capacity 3,402,712,000 cubic feet, representing 438 cubic feet per second for 90 days, no surplus, to cost $15,403.92, can be established. This dam can be further raised 10 feet. About 4,000 linear feet of diking, to cost about $10,000, will be necessary in this case, and increased cost of dam also $10,000.

11. On the Clam River, below Clam Lake, a dam 26 feet high, affording 4,670,786,500 cubic feet reservoir capacity, with surplus of 861,681,980

cubic feet, can be built. The reservoir capacity corresponds to a flow of 602 cubic feet per second for 90 days. To cost $27,217.33.

12. On the Saint Croix proper, above the mouth of Kettle River, a dam 23½ feet high above low water can be established, creating a reservoir of 2,709,500,000 cubic feet capacity, the volume corresponding to a flow of 349 cubic feet per second for 90 days. To cost $60,444.76. Surplus of water, 17,390,826,400 cubic feet. This dam is to retain some of the surplusage from reservoirs above it.

13. A dam on the Ground House River tributary to the Snake River, in Minnesota, to retain a portion of the surplus water of the Lower Snake, 20 feet in height, resulting reservoir capacity 1,045,440,000 cubic feet, corresponding to a flow of 134 cubic feet per second for 90 days, with surplus of 1,218,286,080 cubic feet, can be built, at a cost of $8,500.

14. At Chengwatana, on the Lower Snake River, Minnesota, a dam 13 feet in height above low water, affording reservoir capacity of 3,703,238,000 cubic feet, corresponding to 476 cubic feet per second for 90 days, with surplusage of 13,196,648,080 cubic feet, can be established. To cost $30,000.

Dams exist at Ground House and Chengwatana, operated by private parties. They will be referred to further on.

The reservoirs at Chengwatana and above the mouth of Kettle River thus become the distributing reservoirs for the Lower Saint Croix, and as their locations are about 55 miles from Taylor's Falls, the head of navigation on the Lower Saint Croix, and about 112 miles from Prescott, where the Saint Croix joins the Mississippi, whatever increment is taken from these reservoirs to add to the normal low-water discharge of the navigable stretch of the stream will reach its destination rapidly.

Collecting from the list given above all the items of discharge from the various proposed reservoirs, we see that a quantity of water equal to a flow of 4,415 cubic feet per second for 90 days can be impounded prior to July 1, to be added to the normal discharge of the stream during the low-water period. The measured low-water discharge, as ascertained during the survey made this past season by Assistant Engineer Frederick Terry, is above McLeod's Lake, 12 miles below Taylor's Falls, 2,300 cubic feet per second, and above Prescott, mouth of river, not less than 2,800 cubic feet per second. Adding to these the 4,415 cubic feet per second, we have, respectively, 6,715 cubic feet and 7,215 cubic feet per second for 90 days, or for 120 days, by a proper manipulation of the dams, 5,400 cubic feet per second passing Prescott.

We have taken in the foregoing calculations the average annual precipitation at 25 inches, and 33 per cent. of it as available for storage before July 1. I have not been able as yet to fix the value of the annual precipitation for the entire area, but believe it to be in excess of 25 inches. Much difficulty has been experienced in finding intelligent observers of rain-fall. Much of the country is sandy, and at present well timbered.

Again, gravel and rock in place and some clay is met with. Major Farquhar, in his report of January 23, 1878, thought it possible that 40 per cent. of the rain-fall might be regarded as available for the supply of the streams.

The area of the Saint Croix watershed above Taylor's Falls is about 6,012 square miles, equal to 167,604,940,800 square feet. If over this area but 0.7 foot be regarded as the available rain-fall for the entire year, we have 117,323,458,560 cubic feet supplying the streams, and tributary to the river above Taylor's Falls. Of this quantity, we impound in reservoirs before July 1, 34,334,458,870 cubic feet, leaving a surplus of 82,988,999,690 cubic feet. In addition, we have the 1,600

square miles of water-shed below the Falls to add its quota, so that from the large surplus no detriment is expected to accrue upon this basis to the navigation of the stream prior to July 1. After July 1, we have the contributions from the entire water-shed.

Now, upon the basis of but 25 per cent. of the annual rain-fall being available for storage prior to the 1st of July, by far the safest assumption, being certainly within limits, as shown in my report of the 12th of December, 1879, upon the Mississippi Reservoir System, we find that we can dispense with the dams at Mud Lake, and the Eau Claire lakes (see Table II), and have a total increment to the low-water discharge of 3,901 cubic feet per second for 90 days. Now, when 4,000 cubic feet of water per second pass the Dalles (Taylor's Falls), the wants of navigation on the Saint Croix are met. As not less than 1,900 cubic feet pass the Dalles at low-water, we have, by adding to this figure 3,900 cubic feet, the sum of 5,800 cubic feet per second for 90 days, or, by proper operations of the dams for 120 days, 4,350 cubic feet per second. The amount passing Prescott for 90 days would not be less than 6,700 cubic feet per second, and for 120 days, not less than 5,000 cubic feet per second. The total annual supply tributary above Taylor's Falls, upon the basis of one-fourth the annual precipitation, is 87,154,569,216 cubic feet, leaving as the surplus not held by dams 56,806,708,638 cubic feet. Now, to carry the calculations still further, the entire watershed above the Dalles is 167,604,940,800 square feet. The mean precipitation for the months of March, April, May, and June can be taken (see tables in last report) at about 10 inches. If we assume, for these 4 months, that but one-half (or 5 inches) actually flows into the streams—a safe estimate, probably, because before the first of April the ground in the higher latitudes is not prepared for active absorption, nor does vegetation assert its claims much before that time—we have as the entire supply to the streams of the water-shed above the Dalles, for these months, 69,556,050,432 cubic feet of water. Now, the capacities of the reservoirs (see table I) is about 35,000,000,000 cubic feet, and, if we take this as it is, without reduction on account of the factor $\frac{1}{4}$, we have in round numbers 34,506,000,430 cubic feet of water left, which for the 90 days of April, May, and June, averages about 4,400 cubic feet per second passing the Dalles, the head of navigation. But the reservoirs are supposed to be closed from December 1 to July 1. We are then entitled to add to the foregoing the larger portion of the precipitation for the months of December, January, and February, and if, as is most probable, three-fourths of this quantity is available, we have, to add to that above calculated, as passing Taylor's Falls, independently of the reservoirs, in round numbers, 27,000,000,000 cubic feet. These calculations and comparisons would seem to prove the feasibility of reservoirs upon the headwaters of the Saint Croix, as adjuncts to navigation, especially as we have, in using the factor $\frac{1}{4}$, made allowance for every possible item of diminution of the water supply.

My assistants who have examined the country are of the opinion that the dams, if built and operated as above, will offer no detention to the passage of logs, as the reservoirs will all be filled before the logs are ready to pass the dams in any numbers, and the calculations seem to fully bear out this assertion. This subject will, however, be further investigated. Inspection of tables I and II shows that a large surplus exists for many of the reservoirs, so that, if necessary to sluice the logs through before these reservoirs are filled and ready for operation, sufficient water can be spared from most of the reservoirs without infringing upon the quantity to be impounded. If we assume, however, that

500 cubic feet of water per second has to be drawn in all from such reservoirs as have no calculated surplus, for as long a period even as 90 days in the spring, it can be seen, from the calculations and inspection of the tables and maps, that no perceptible effect upon the general results will obtain.

There are mechanical devices by means of which logs can be passed over dams rapidly and without waste or use of water.

The management of the dams is a matter of detail to be arranged by careful calculations and from experience gained in operating them.

The estimated cost of the proposed dams for the headwaters of the Saint Croix is $385,720.28. This is only an approximation, as borings have still to be made at many of the selected sites; the cost of materials and labor is not, for the region under consideration, thoroughly known to us; and the value of the land liable to be overflowed has not yet been taken into consideration in the estimates, for the same reason. The lists of lands liable to overflow from the construction of the proposed dams are as correct as can be made at present. The land is generally of little value. The swell or amplitude to be caused by dams placed across streams where the current is rapid has not been considered, it being impossible to calculate it with any certainty on account of the varying conditions for and at each reservoir, rapids running into and from broad expanses of water, &c. It seems best, therefore, to allow a broad margin in the case of overflow, and although the contours or flowage lines are taken as the intersections of the surface of the country by planes of true level passed through the combs of the dams, it will be safer, in the case of a portion of a section of land appearing liable to be overflowed, to assume the entire section as thus affected until, at least, actual trial proves the contrary. The township plats appended show the contours as projected under the assumption that the surface of the ponded-up water is a plane of true level; they also show the entire sections in which these contours lie. These remarks apply as well to the Chippewa and Wisconsin rivers as to the Saint Croix.

It is proposed to construct the dams of timber, rock, and earth, as may be most easily attainable. Several short dikes, to prevent the impounded water flanking the dams, are also provided for and included in the approximate estimate for each site.

Bearing upon the existing dams owned and operated by private parties and corporations, Assistant Simar says:

> The sluicing-dams in Wisconsin are operated under charters granted by the State to private parties or corporations, generally for a term of 15 years.
>
> In Minnesota, dams for sluicing logs, timber, or lumber are constructed and operated under a general license law passed by the State in 1861, which authorizes the county commissioners of the counties wherein dams are to be located to grant license, providing such dam is necessary at the point applied for, and that the land is in the possession of the parties applying therefor. Licenses may be granted for a period not exceeding 6 years, and renewed upon application. Bonds of not less than $1,000 required. Toll on logs, lumber, or timber not to exceed 6 cents per 1,000 feet, board measure, except in the case of the Snake River dam (Chengwatana), which is allowed toll not exceeding 10 cents per 1,000 feet, board measure. Chengwatana dam was originally built and operated under a charter granted from the Territorial government.
>
> The cost of dams, as submitted in Table I, does not include cost of damage to property, or the rights and franchises of private parties or corporations owning sluicing-dams at or near the points where our selections of dam-sites were made. In regard to the latter, I think it would be a matter of small consequence, providing those parties were furnished with water for driving purposes to suit their convenience. In the case of the dam at Chengwatana, owned by Mrs. Anna Munch, of Saint Paul, a new dam at this point, built of earth and stone, would cost about $30,000; whereas the present dam, with repairs sufficient to raise the head to 13 feet, might be secured at a probable cost of $15,000 by giving the proprietors the same rights for sluicing logs and using water which they now have. This is a new dam, and would answer every purpose at

this point for 10 years or more with the usual repairs which timber structures require. In submitting the cost of a dam at this point, however, I estimate $30,000, this being a safe estimate in either case. In regard to damage to property by overflow, at this time we are not provided with sufficient information to give an intelligent estimate.

In assuming one-fourth of the annual rainfall as available, dams at Eau Claire and Mud Lakes will not be required.

The cost of dams on Upper Saint Croix, Rice, and Clam Lakes will be materially reduced.

The list of existing sluicing-dams does not comprise all existing dams on the Saint Croix watershed, but those which were found as far as examinations were extended or likely to be of use in a system of reservoirs.

## HEADWATERS OF THE CHIPPEWA RIVER.

The average annual precipitation for this region is taken at 30 inches (see tables of rainfall, report of January 15, 1879). Tables I to IV inclusive, giving results based upon one-third and one-fourth the annual rainfall, with alternate propositions for dams and reservoirs, and approximate cost thereof, as submitted by Assistant Johnson, are appended. Considering Table II—that based upon one-fourth the annual rainfall—we see that 12 eligible sites for dams have been found. They are—

1. On the Manatouish River, at the outlet of Rest Lake. Proposed dam 15 feet in height and 250 feet in length. Resulting reservoir capacity 1,840,000,000 cubic feet, corresponding to 236.62 cubic feet per second for 90 days. Surplus supply 1,847,615,360 cubic feet, to be retained in Bear Creek reservoir. To cost $7,665.

2. On Bear Creek, about 10 miles below the outlet of the Flambeau Lakes. Proposed dam 15 feet in height and 2,500 feet in length. Resulting reservoir capacity 5,406,567,152 cubic feet. Excess of capacity over supply 2,955,591,152 cubic feet. Adding to the supply the surplus from Rest Lake reservoir, we have 4,298,591,360 cubic feet, corresponding to a flow of 552.81 cubic feet per second for 90 days. To cost $47,500.

Taking these two reservoirs together we have surplus capacity of 1,107,975,792 cubic feet.

3. Below Park Lake, on the Turtle River. Proposed dam to be 15 feet high and 297 feet in length. Resulting reservoir capacity 620,782,720 cubic feet, furnishing for 90 days 79.83 cubic feet of water per second. To cost $9,941. Surplus water, 2,410,993,280 cubic feet.

4. At the outlet of Butternut Lake. A dam can be built at this point 10 feet in height and 336 feet in length, affording reservoir capacity of 585,446,400 cubic feet, corresponding to 75.26 cubic feet per second for 90 days, with surplus of 111,513,600 cubic feet. To cost $5,216.

5. At the outlet of Round Lake on the Upper Doré Flambeau. Proposed dam to be 10 feet in height and 170 feet in length. Resulting reservoir capacity 1,303,036,416 cubic feet, equal to 135.93 cubic feet per second for 90 days. To cost $10,550. Excess of capacity of reservoir 245,980,416 cubic feet.

About 2 miles below the outlet of Squaw Lake. Proposed dam to be 9 feet in height; length, 250 feet. Resulting reservoir capacity 731,808,000 cubic feet, representing a flow of 84.70 cubic feet per second for 90 days. Cost, $4,000. Excess of reservoir capacity 73,170,800 cubic feet.

7. Below the outlet of Bear Lake, East Fork of the Chippewa River. Proposed dam 19½ feet high and 1,015 feet long. Resulting reservoir capacity 1,113,148,856 cubic feet, corresponding to 143.15 cubic feet per second for 90 days. To cost $25,925. Surplus supply 3,147,019,144 cubic feet.

8. At Little Chief Lake, East Fork of the Chippewa River. Dam to be

24 feet in height and 710 feet in length. Resulting reservoir capacity 771,332,009 cubic feet, corresponding to 99.19 cubic feet per second for 90 days. To cost $40,702. Surplus supply 232,290,391 cubic feet.

9. At the outlet of Moose Lake, West Fork of the Chippewa River. Proposed dam to be 25.7 feet in height and 1,235 feet in length. Resulting reservoir capacity 2,021,783,402 cubic feet, corresponding to 260 cubic feet per second for 90 days. To cost $45,090. Surplus supply 1,712,179,798 cubic feet.

10. Below Pa-kwa-wang Lake, West Fork of the Chippewa River. Proposed dam to be 23 feet in height and 840 feet in length. Resulting capacity of reservoir 6,193,632,598 cubic feet. Excess of capacity over supply from its own watershed 1,712,179,998 cubic feet, which can be made up from the Moose Lake surplus. This will then afford 796.50 cubic feet per second for 90 days. Cost, $55,617. The establishment of this dam will flood out the Chippewa Indian village of Pa-kwa-wang. This dam may, however, deprive a short stretch of the West Fork, below the dam-site, of the necessary quantity of water for a time for running logs. It will be seen from the tables that the surplus supply at Bear Lake reservoir joined to that of the watershed of Little Chief Lake is, in round numbers, 3,400,000,000 cubic feet. By raising the proposed dam at Little Chief Lake a foot or more the necessary amount of water to establish the flow in the lower part of the West Fork, above alluded to, can, as reported by Assistant Johnson, be turned into the Pa-kwa-wang reservoir, whence, as surplus water, it will feed the stretch referred to. (See A, general map.)

11. At Lac Courtes-Oreilles proposed dam to be 5 feet in height, and 260 feet in length. Resulting reservoir capacity 1,986,336,000 cubic feet, equivalent to a flow of 255.44 cubic feet per second for 90 days. To cost $1,631.

By reference to the map it will be seen that there are two large-sized lakes within this watershed that have no indicated outlets on the land maps. Time did not admit of tracing these up. It is here assumed that they lie within the Courtes Oreilles watershed. Persons professedly familiar with the country claim that they feed Lac Courtes-Oreilles.

12. On the Chippewa River, below the mouth of Paint Creek. A dam 22 feet in height and 620 feet in length can be built here. Resulting reservoir capacity 505,336,720 cubic feet, equivalent to 64.99 cubic feet per second for 90 days. To cost $60,000.

Summing up, we have in round numbers from all the reservoirs above enumerated 2,800 cubic feet per second for 90 days to add to the normal low-water discharge of the stream. The low-water discharge of the Chippewa River at the mouth, or at the jetties, may be taken at about 2,600 cubic feet per second, and about 3,400 cubic feet just above the entrance to Beef Slough. When 4,000 cubic feet per second pass through the jetties, good navigation obtains from the mouth to Eau Claire. Adding the increment (2,800 cubic feet) from the reservoirs to the 2,600 cubic feet at the mouth, we have at least 5,400 cubic feet per second for 90 days, or 1,400 cubic feet per second more than absolutely required for purposes of navigation. If, for purposes of sluicing logs, it becomes necessary to draw upon the reservoirs before July 1, there will, at most of the reservoirs, be more water available than required. To get this quantity of water, per second, eventually reaching the Mississippi for the same period, we must consider the quantity flowing through Beef Slough, which, added to the 5,400 cubic feet, gives 6,200 cubic feet.

Touching this region, Assistant Johnson says:

Northern Wisconsin is still a vast wilderness, and, from the progress that emigration has made into that portion of the State since it was opened by the Wisconsin Central

Railroad, it promises to remain so for twenty or thirty years to come. This is partially owing to the labor required in clearing up the land, but more especially to the fact that the clay soil which predominates in that region is generally impervious to water. Besides this, rocks are so common in the soil that the lands are not desirable for farming purposes. Even in swamps we invariably find bowlders and gravel at the bottom. Hence it is difficult to see where the existence of reservoirs in this region will interfere either directly or indirectly with agricultural interests.

In regard to damages to water-power for mill-sites, it is not probable that lumber will ever be manufactured in this region, for the reason that the market for lumber of the Chippewa Valley is in the Mississippi Valley, and, until we reach the vicinity of Chippewa Falls, it would be impossible to run lumber without going to unwarrantable expense.

In view of the above considerations the reservoirs will not be detrimental to the manufacture of lumber. The only cause of complaint that could arise, providing that the lumbering interests were made subservient to the interests of commerce in the Mississippi Valley, is perhaps a delay of one or two months in getting the drives to their destination at Chippewa Falls, Eau Claire, and points below. But when we consider that during winters when the fall of snow is very small the lumbering interests are embarassed during the entire season following, as was the case on the Chippewa in 1878, a delay of a month or two is only a guarantee in the end of successful operations during each season.

The area of watershed tributary to the river at Chippewa Falls is about 5,500 square miles, the total area drained by the river being about 9,600 square miles.

The approximate total cost of the dams and dikes would be $313,837. Construction of timber, earth, gravel, and rock.

## HEADWATERS OF THE WISCONSIN RIVER.

The average annual precipitation for this region is also taken at 30 inches (see tables of rainfall report of January 15, 1879). Calculations have been made, based upon one-third and one-fourth the rainfall as factors, the results of which are given in appended table I, Headwaters of the Wisconsin.

The great difficulty for the Wisconsin system consists in finding storage capacity for water. But six eligible sites for dams for the formation of reservoirs of any size have been found from the surveys of this or of last season. They are:

1. On the Wisconsin, below Eagle River, at Otter Rapids. A dam can be constructed here 22 feet high, 1,300 feet in length, affording reservoir capacity of 7,389,727,488 cubic feet, corresponding to a flow of 950.32 cubic feet per second for 90 days. Surplus, 220,262,592 cubic feet. Dam and necessary diking to cost $38,113.

2. On Sugar Camp Creek, about 1½ miles from its junction with the Wisconsin. A dam can be built at this locality 12½ feet in height, 235 feet in length, to create reservoir capacity of 1,356,284,160 cubic feet, the surplus capacity being 339,884,160 cubic feet, and the quantity of water impounded for one season furnishing a supply of 130.71 cubic feet per second for 90 days. Cost of dam and diking, $8,162.

3. On the Wisconsin River, just above the mouth of Pelican. A dam can be constructed here 28 feet in height, and 800 feet in length, affording reservoir capacity of 5,153,180,527 cubic feet, corresponding to 662.71 cubic feet per second for 90 days. Surplus supply, 13,325,873 cubic feet. Cost of dam and diking, $62,929.

4. On the Upper Tomahawk. A dam 12 feet high, and 190 feet long, affording 2,226,113,036 cubic feet reservoir capacity, corresponding to 217.37 cubic feet per second for 90 days. Surplus reservoir capacity, 535,810,796 cubic feet. To cost $4,729.

5. Below Squirrel Lake, on the Tomahawk, a dam 17 feet in height, and 315 feet in length, will create reservoir capacity of 1,338,163,200 cu-

bic feet, corresponding to a discharge of 121.52 cubic feet per second for 90 days. Surplus reservoir capacity, 393,201,600 cubic feet. Cost of dam, $17,115.

6. On the Tomahawk, below Rice Lakes. A dam can be placed here 14 feet in height, and 1,100 feet long, to create reservoir capacity of 1,043,516,880 cubic feet, corresponding to 134.19 cubic feet per second for 90 days. Surplus supply, 5,821,539,120 cubic feet. To cost $24,930.

Dams at Lac Vieux Desert and Twin Lakes can be established to hold the surplus at Otter Rapids.

On account of the forced locations for these dams so near the extreme sources, the reservoir capacity produced by several of them is in excess of the supply, although the total surplus from the area tributary to the proposed reservoirs is estimated at 4,500,000,000 cubic feet.

The quantities above given are based upon one-fourth the rainfall as a factor.

It is claimed by some and denied by others, who profess familiarity with the Wisconsin River, that a site for a high dam exists below the junction of the Tomahawk and Wisconsin rivers, and that a reservoir can be created of sufficient capacity to retain the surplus waters from the reservoirs above. It is of importance to settle this question, and it is proposed, as soon as an opportunity occurs, to send a small party to examine the ground instrumentally, and also to further examine Pelican River.

With the reservoirs now found practicable we can deliver, in round numbers, 2,300 cubic feet per second for a period of 90 days. This quantity, considered as an increment to the discharge of the Mississippi River at the mouth of the Wisconsin, would be too small to prove of benefit to the Mississippi below that point. The surplus water from the areas tributary to the proposed reservoirs is so great that we can dismiss the question of any diminution of the 2,300 cubic feet on account of evaporation from surfaces of reservoirs, or *en route* to the lower river, or by absorption *en route*..

Lagrené (*Cours de navigation intérieure*) states that the rate of evaporation from water in a state of agitation compared with that from the surface of a body of water at rest has been reported as 65 to 45. Of course this proportion varies with localities and change of conditions. The discharge of the impounded water will in some cases upon the Wisconsin (and also upon the Saint Croix and Chippewa rivers) pass over rapids of greater or less expanse. But any such items of diminution sink into insignificance when compared with the surplus, not only from the areas above the reservoirs, but from the watershed generally. The matter is merely touched upon here to show that it has received attention.

A small portion of the surplus waters may be held by converting Lac Vieux Desert and Twin Lakes into reservoirs by the construction of dams at an estimated cost of $15,000 to $20,000.

The entire area of the Wisconsin River watershed is about 11,800 square miles. The total area above the proposed reservoirs is about 1,410 square miles, and the area of watershed tributary to the river above Portage, the head of navigation, is, after deducting that from which the reservoirs would draw their supply, about 6,800 square miles. So that no injurious effects are expected to accrue to navigation upon the Lower Wisconsin at any time owing to the impounding of water before July 1. As to any interruption to the operations of log-driving before the gates can be opened, or as to the quantities of water, if any,

necessary to be expended from the reservoirs before July 1 for sluicing logs, I am not at this moment prepared to speak decidedly.

The advantage of driving logs with sufficient supply of water will, doubtless, be considered by lumbermen as compensation for any short delay. Whether an increment of 2,300 cubic feet per second for 90 days, added to the normal discharge of the stream during a period of 90 days, when low-water ordinarily occurs, will be of material benefit to the navigable stretches below the proposed dams or not is a matter in regard to which I would respectfully defer to the officer in charge of the improvement of the Wisconsin River.

The total estimated cost of the proposed dams, including those at Vieux Desert and Twin Lakes, is, as given by Assistant Raynolds, $170,978. This estimate is only an approximate one, it being difficult to arrive at close estimates for the region under consideration, and especially so in the absence of borings at selected dam-sites.

Damage to property from overflow, caused by the proposed dams, has not been arrived at, but it will be, it is thought, slight, as the land is generally of little value. Lists of lands liable to overflow, as complete as can be made at present, are appended.

EFFECT UPON THE NAVIGATION OF THE MISSISSIPPI RIVER OF ALL THE RESERVOIRS, INCLUDING THOSE AT THE SOURCES OF THE MISSISSIPPI.

Collecting the various items of discharge, we find that we can control, from the proposed reservoirs at the sources of the Mississippi, sufficient water to insure a steady flow of, at the least, 12,200 cubic feet per second, past Saint Paul, for 100 days (see my report of December 12, 1879); and from the Saint Croix, for the same period, 6,000 cubic feet per second. The sum of these gives about 18,000 cubic feet per second for 100 days.

A gauging of the Mississippi River, in the fall of 1878, taken several miles below the mouth of the Saint Croix, under the direction of Major Farquhar, Corps of Engineers, reduced to the low-water of 1864, showed 10,100 cubic feet of water per second passing that point, or but little more than one-half of the quantity that can be assured for 100 days, as above stated. Now, carrying our quantity forward to the mouth of the Chippewa, neglecting the area of watershed tributary to the river between the Saint Croix and the mouth of the Chippewa, we have at the latter point 4,860 cubic feet more per second for 100 days, or, in all, 22,860 cubic feet per second for 100 days. And passing the mouth of Beef Slough we have about 23,660 cubic feet per second for the same period; in round numbers, 24,000 cubic feet.

A gauging of the Mississppi River at Winona, about 30 miles below Beef Slough, under direction of Major Farquhar, in 1878, reduced to the low-water of 1864, showed 11,190 cubic feet of water per second passing that point, or less than one-half of the quantity that can be assured from the combined operation of the proposed reservoirs at the sources of the Mississippi, Saint Croix, and Chippewa rivers, added to the normal low-water flow of these three streams—24,000 cubic feet per second for a width as at Winona would afford not less than 5 feet in the channel.

We have thus far neglected the smaller watersheds between the mouth of the Saint Croix and the mouth of the Chippewa. By examining the table of watersheds, Appendix X, we see that between the mouth of Beef Slough and the mouth of the Wisconsin is a watershed of about 8,000 square miles. The precipitation over this area for the

months of July, August, September, and October may be taken as averaging 12 inches. Assuming $\frac{1}{4}$ as a factor, we have as additional quantity of water just above the Wisconsin an average of 5,400 cubic feet for 120 days, or omitting the 20 days, in all, a little more than 29,000 cubic feet for 100 days; and just below the mouth of the Wisconsin (adding the low-water flow of that stream to the 2,300 cubic feet from its reservoirs), at least 36,000 cubic feet per second for 90 days. As to what can best be accomplished on the Mississippi River below Saint Paul by these volumes the officer in charge of that stretch of river is better prepared to answer.

The figures that have been taken as representing the low-water flow of these streams are much below their *average* discharges between July 1 and the middle of November.

Many of the reservoirs will have, when considered only with reference to one season, large surplus capacities. But, on the other hand, there may be expected to compensate seasons when the full supply will not be drawn upon. In this case, the water can accumulate and fill them to their maximum capacities.

As regards the effect upon the quantity of rainfall annually by deforesting and rewooding extensive areas of country, I will, without referring to meteorological observations made by myself, refer to those tabulated in my report of January 15, 1879. By an inspection of these tables it will be seen that the Saint Paul records cover seven consecutive years, viz, from 1872 to 1878, inclusive.

The annual rainfall is for—

SAINT PAUL, MINN.

| | Inches. | | Inches. |
|---|---|---|---|
| For 1872 | 28.86 | For 1876 | 23.67 |
| 1873 | 33.74 | 1877 | 28.80 |
| 1874 | 35.57 | 1878 | 22.09 |
| 1875 | 30.66 | | |

FORT SNELLING, MINN.

| | | | |
|---|---|---|---|
| For 1837 | 24.02 | For 1853 | 20.47 |
| 1838 | 27.72 | 1854 | 26.59 |
| 1839 | 21.19 | 1855 | 24.75 |
| 1840 | 23.17 | 1856 | 22.62 |
| 1841 | 21.67 | 1857 | 32.09 |
| 1843 | 23.70 | 1868 | 32.21 |
| 1844 | 30.24 | 1869 | 34.83 |
| 1845 | 25.34 | 1870 | 26.07 |
| 1846 | 26.10 | 1871 | 21.78 |
| 1847 | 21.80 | 1872 | 17.02 |
| 1848 | 23.18 | 1873 | 18.71 |
| 1849 | 49.69 | 1874 | 18.56 |
| 1850 | 25.50 | 1875 | 27.12 |
| 1851 | 23.42 | 1876 | 28.32 |
| 1852 | 15.07 | 1877 | 31.43 |

FORT RIPLEY, MINN.

| | | | |
|---|---|---|---|
| For 1850 | 35.32 | For 1862 | 14.39 |
| 1852 | 34.52 | 1863 | 17.20 |
| 1853 | 26.12 | 1867 | 30.34 |
| 1854 | 18.49 | 1868 | 28.03 |
| 1855 | 23.55 | 1871 | 34.02 |
| 1856 | 25.33 | 1872 | 34.77 |
| 1858 | 19.81 | 1873 | 40.78 |
| 1859 | 26.00 | 1875 | 28.17 |
| 1860 | 30.61 | 1876 | 19.48 |
| 1861 | 32.42 | | |

FORT RIDGELY, MINN.

| | Inches. | | Inches. |
|---|---|---|---|
| For 1855 | 34.78 | For 1860 | 16.97 |
| 1856 | 23.20 | 1861 | 21.89 |
| 1857 | 38.38 | 1862 | 30.05 |
| 1858 | 22.52 | 1863 | 18.17 |
| 1859 | 32.85 | 1864 | 14.46 |

DULUTH, MINN.

| | | | |
|---|---|---|---|
| For 1873 | 38.42 | For 1876 | 31.86 |
| 1874 | 39.86 | 1877 | 32.19 |
| 1875 | 25.13 | | |

FORT PEMBINA, DAK.

| | | | |
|---|---|---|---|
| For 1872 | 17.19 | For 1875 | 11.60 |
| 1873 | 14.05 | 1876 | 24.70 |
| 1874 | 11.88 | 1877 | 22.04 |

FORT ABERCROMBIE, DAK.

| | | | |
|---|---|---|---|
| For 1861 | 23.39 | For 1868 | 18.90 |
| 1862 | 11.38 | 1870 | 20.47 |
| 1863 | 13.40 | 1871 | 15.27 |
| 1864 | 16.85 | 1872 | 27.83 |

FORT WINNEBAGO, WIS.

| | | | |
|---|---|---|---|
| For 1837 | 31.34 | For 1841 | 28.45 |
| 1838 | 27.88 | 1842 | 24.51 |
| 1839 | 28.95 | 1843 | 22.80 |
| 1840 | 27.12 | | |

FORT HOWARD, WIS.

| | | | |
|---|---|---|---|
| For 1836 | 37.64 | For 1839 | 31.28 |
| 1837 | 40.55 | 1840 | 33.57 |
| 1838 | 37.56 | 1851 | 31.47 |

The felling of timber has been actively carried on over the greater portions of Minnesota and Wisconsin for the past thirty years, having been especially active for the past fifteen years, and the records do not indicate any decrease in the annual precipitation due to deforesting the country. Nor does there appear from inspection of the monthly means of rainfall contained in the report above referred to any logical connection between the felling of trees and the distribution of the rainfall by seasons. It would be premature, however, to express any decided opinion in this matter, as nothing but long continued observations can furnish the means of arriving at conclusions in the case. Meteorological conditions vary for different areas.

Cultivation of the ground may, it is much easier to see, affect the flow of water into the streams, sometimes conducing to a rapid increase in the volumes of the streams, and again retarding the flow so as to maintain a more equable stage, depending upon surface and subsurface formation, &c. Long continued observations of the daily stand of water in the principal affluents and the main streams, as well as frequent gaugings of the flow of water in each, afford the only means of arriving at any conclusions of value upon this point.

We have ascertained as far as possible, to date, the extent of property liable to overflow or to be affected by the construction of the proposed dams. Doubtless some interests will be benefited by the creation of the reservoirs; others, again, will be injured. Many of the dams proposed will, if constructed, develop water-power.

The examinations necessarily covered more ground than was at first anticipated. Much of the information that had been furnished the parties by persons professing familiarity with the country was found, upon examination of the ground, to be worthless. The greater part of the

field work has been accomplished, but reconnaissances of several possible sites ought to be made. In addition, borings at most of the selected dam-sites upon the Saint Croix, Chippewa, and Wisconsin rivers should be made in order that estimates of the cost of foundations may be rendered with more exactness than can be done at present. Meteorological observations should be continued in Wisconsin for another year at least, and the main streams and affluents more thoroughly gauged. The estimated cost of the examinations and observations is $10,000.

I would especially invite attention to the valuable reports of Assistants Simar, Johnson, and Raynolds, herewith submitted.

Assistant J. D. Skinner has continued in immediate charge of the parties in the field, contributing largely to the successful operations of the season.

I am much indebted to Mr. J. P. Frizell, principal assistant, and to Assistant Engineers Guy Wells and C. J. A. Morris in the matter of estimates for and details of dams, &c.

It will be seen from the foregoing that if the plan of reservoirs as adjuncts to the navigation of the Upper Mississippi, Saint Croix, Chippewa, and Wisconsin be adopted, good results for each stream, and ultimately to the main Mississippi, can best be realized by the construction of all the dams proposed. The question of expediency, however, is one with which the engineer generally has little to do, his office commonly being to present facts and figures.

In order to operate the dams to best advantage they should all come within telegraphic communication with a central office. The cost of telegraph-lines, including batteries, &c., for the several systems, is estimated as follows:

| | |
|---|---|
| For the Upper Mississippi | $15,525 |
| For the Saint Croix | 12,750 |
| For the Chippewa | 9,000 |
| For the Wisconsin | 9,000 |

These estimates may be reduced as private telegraph-lines multiply and where consolidation can be effected in the case of several dams being separated from each other by but a few miles.

The cost of maintaining the dams, &c.—understanding by this the repairs—is not easy to state. From the best information to date, I assume that, if well-built, 15 per cent. of their original cost will suffice for the first ten years.

The cost of operating a dam would probably average $800 per annum. The dam-tenders could perform the duties of telegraph operators and meteorological observers also. Some reduction in expense of operating dams might be made by consolidation. A system of gauge-rods at prominent points on the streams and the employment of gauge-readers would also be necessary. Probable cost per annum, $1,500.

## RECAPITULATION OF ESTIMATES.

*Sources of the Mississippi.* (See report of December 12, 1879.)

| | |
|---|---|
| Dams | $386,927 39 |
| Telegraph-lines, &c | 15,525 00 |
| Total | 402,452 39 |
| Maintenance the first ten years, 15 per cent | 60,367 85 |
| Cost of operating dams, per annum | 5,600 00 |
| Gauge-rods and observers, per annum | 375 00 |

*Sources of the Saint Croix.*

| | |
|---|---|
| Dams | $385,720 28 |
| Contingencies of engineering, 10 per cent | 38,572 02 |
| Telegraph-lines, &c | 12,750 00 |
| Total | 437,042 30 |
| Maintenance first ten years, 15 per cent | 65,556 34 |
| Cost of operating, per annum | 6,400 00 |
| Gauge-rods and observers, per annum | 375 00 |

*Sources of the Chippewa.*

| | |
|---|---|
| Dams | $313,837 00 |
| Contingencies of engineering, 10 per cent | 31,383 70 |
| Telegraph-lines | 9,000 00 |
| Total | 354,220 70 |
| Maintenance first ten years, 15 per cent | 53,133 10 |
| Cost of operating dams per annum | 5,600 00 |
| Fauge-rods and observers, per annum | 375 00 |

*Sources of the Wisconsin.*

| | |
|---|---|
| Dams | $170,978 00 |
| Contingencies of engineering, 10 per cent | 17,097 80 |
| Telegraph-lines | 9,000 00 |
| Total | 197,075 80 |
| Maintenance first ten years, 15 per cent | 29,561 37 |
| Cost of operating, per annum | 4,000 00 |
| Gauge-rods and observers, per annum | 375 00 |

To accompany this report are appendixes *a* to *x*, inclusive, and the following-named maps and plots:

One general map of the Saint Croix water-shed.
One general map of the Chippewa water-shed.
One general map of the Wisconsin water-shed.
One plotting of gauge-readings at Taylor's Falls, Saint Croix River, 1879.
One plotting of gauge-readings at Stillwater, Saint Croix River, 1879.
One plotting of gauge-readings at Eau Claire, Chippewa River, 1879.
One plotting of gauge-readings, mouth of Chippewa River, 1879.
One set colored plats, lands liable to overflow, Saint Croix River.
One set colored plats, lands liable to overflow, Chippewa River.
One set colored plats, lands liable to overflow, Wisconsin River.
In all, 24 appendixes and 10 maps and plots.

Very respectfully, your obedient servant,

CHAS. J. ALLEN,
*Captain of Engineers.*

Brig. Gen. H. G. WRIGHT,
*Chief of Engineers, U. S. A.*

---

## APPENDIX *a*.

### SAINT CROIX RIVER.

REPORT OF MR. VINE D. SIMAR, ASSISTANT ENGINEER.

ENGINEER OFFICE, UNITED STATES ARMY,
*Saint Paul, December* 30, 1879.

SIR: I have the honor to submit the following preliminary report of surveys and examinations of the sources of the Saint Croix River, with tracing of general map showing water-shed, location of dam-sites, capacity of holding-grounds, and such information as could be shown in the time allotted to this report. The work consisted in the examination of those portions of the Saint Croix water-shed, of which previous

examination had not been made, to ascertain if any and what amount of water can be held by reservoirs in addition to the results of last year, and the cost of constructing dams, with as much information of value as possible. Work was commenced June 4, by sending a detached party into the field in charge of Assistant R. Davenport, with instructions to run a base line of levels from Rush City on the Saint Paul and Duluth Railroad, across and up the valley of the Saint Croix River to Upper Lake Saint Croix, making connections with the work done last year, and leaving bench-marks at prominent points to facilitate future operations. Upon the completion of this work it was thought best to run a line of levels up the Namekagon River from Veazie's Ranch to Little Puckwawance; this was done by Assistant Davenport, who then reported to the main party at Rice Lakes, June 28.

The main party left Saint Paul June 12, via the North Wisconsin Railroad to Granite Lake, at that time the terminus of the line, and about 20 miles distant from Yellow River crossing. This distance was made by teams through the Big Woods and over execrable roads. Upon arriving at Yellow River, the 14th, work was started from this point by running a line of levels up the river to Mud Lake. This lake has an area of 2¼ square miles, and can be made available for holding any small surplus not held at more eligible points. A line of levels was run down the river from Yellow River crossing to Rice Lakes, at which point a dam-site was selected, and survey made, to obtain, if possible, holding-grounds for the surplus not held on Yellow River.

The dam-site affords a rise of 25 feet above low-water. This was taken as the proposed height of dam, and contour lines run to that elevation. After completing the survey of the dam-site, transit lines were run around the entire holding-grounds, and as near as practicable to the line of flowage. A line of levels followed, and frequent cross-section lines were run out, to accurately determine the flowage line. Intermediate lines were run with compass where required. The location of the dam-site is the best that could be found. It has a length of 500 feet on top, while the valley is about 250 feet wide at a rise of 15 feet. The banks of the stream are composed of sand and fine gravel. The bed of the river consists of sand and gravel to a depth of 10 to 15 feet. At this depth there appears to be a deposit of clay and gravel; this, however, could not be accurately determined with the appliances with which we were provided. In addition to the dam proper, there will be required, at different points, about 1,500 linear feet of dike, of an average height of 13 feet. Our surveys show the following results on Yellow River:

| | |
|---|---|
| Area of water-shed, 321½ square miles | 8,962,905,600 square feet. |
| Available rainfall | 0.7 foot. |

| | Cubic feet. |
|---|---|
| Supply from water-shed | 6,274,033,920 |
| Capacity of reservoirs: | |
| Yellow Lake, survey of 1878 ..... cubic feet | 3,402,712,000 |
| Rice Lake, survey of 1879 ..... do | 2,474,944,500 |
| Total holding capacity | 5,877,656,500 |
| Leaving a surplus of | 396,377,420 |

which can be held on Mud Lake with 6 feet rise of dam, thus leaving no surplus on Yellow River.

From reservoirs, full, can be furnished for 90 days, per day, 69,711,488 cubic feet; per second, 807 cubic feet.

CHARACTER OF THE STREAM.

Yellow River is termed a constant stream, from the small range in the natural rise and fall of the river throughout the year, which varies from 1½ to 3½ feet, owing to locality. Springs and spring creeks are numerous on the upper portions of the stream. The valley is generally narrow, being from 200 to 800 feet in width, although in some localities it widens into tamarac marshes of considerable extent. The first banks have a general elevation of 15 feet above low-water, running back into high broken ridges covered with white, Norway, and Jack pine. There are some rapids on the upper portion of the river. Little or no stone or bowlders are found until reaching the rapids below Yellow Lake, which are almost continuous to the mouth of the stream.

Our next point of operations was on the Namekagon River, about 32 miles above the mouth, near Veazie's Ranche. This is the most available point for holding-grounds above the mouth of Totogatic River and below Namekagon Lake. It was not deemed advisable to make a survey at the latter point, there being only 43 square miles of watershed to supply a reservoir which gives by one-third the annual rainfall, about 800,000,000 cubic feet. This amount can be held by the sluicing-dam in operation at the outlet of Namekagon Lake.

The dam-site at Veazie's affords a height of 30 feet. Contour lines were run to this elevation, the work being done in a similar manner as at Rice's Lakes. Upon completing the survey, it was found that the holding-grounds were not as large as had been anticipated. They comprise: Whalen's Lake and the valley of Whalen's Creek on the north; Trout Brook on the south; the valley of the Namekagon to the mouth of Spring Brook, and the valleys of Bean Brook and Jordan Creek between these points. These valleys are small, sloping to higher grounds on either side, rendering the holding-capacity of the reservoir small.

*Dam-site.*—The banks are high at this point, the length of dam being 380 feet, to which must be added 700 linear feet of dike, with an average height of 6 feet on the north side of the river. The river banks are sand and light soil; the bed of the stream is of sand and fine gravel to a depth of 6 to 10 feet. Careful soundings were taken to determine, if possible, the nature of this substratum, which was thought to be clay and gravel or some equally hard material. Upon completing our work at this point, examinations were continued down the river. A line of levels was run down the river to Moore's Station, 1½ miles below the mouth of the Totogatic, to connect with the base line of levels run from Rush City. Observations were frequently made to determine the slope of the river. Arriving at the mouth of McKenzie Brook, a line of levels was run up the creek to McKenzie Lake to ascertain, if possible, how to utilize this and the lakes above for holding-grounds on the Namekagon River, as it was thought possible to flow these lakes by putting a dam across the Namekagon, a short distance below the mouth of the creek. This was found to be impracticable, there being a rise of 33 feet from the mouth of the creek to the first lake, a distance of 2½ miles. Hasty examinations were made in the vicinity of Webb Creek and Lake and at the mouth of the Totogatic River to find, if possible, sufficient holding-grounds to justify us in making a survey at this point, the surplus on the Namekagon being very large. Subsequent surveys were made with the following results: By putting a high dam across the Namekagon, 1 mile below the mouth of the Totogatic River, a large holding-ground can be obtained and the supply be drawn from either of the two named rivers. Forty feet were taken as the rise of dam. Transit and level lines were run up the Totogatic a distance of 10 miles, to the mouth of Chicorg Creek, and up the Namekagon to Casley Brook, 12 miles above the dam-site. From these base lines numerous intermediate, transit, compass, and stadia lines were run out, as occasion required. The area of holding-grounds is about 7½ square miles, comprising 10 miles of the valley of the Totogatic, 12 miles of the valley of the Namekagon, Webb Creek Valley, Webb Lake, and some small lakes, with adjacent marshes and low lands. Our surveys show the following results on the Namekagon River:

| | |
|---|---|
| Area of watershed above lower dam-site = 648 square miles. | 18,065,203,200 square feet. |
| Annual rainfall | 25 inches. |
| Available rainfall | 0.7 foot. |

| | Cubic feet. | |
|---|---|---|
| Supply from watershed | | 12,645,642,240 |
| Capacity of reservoirs: | | |
| Veazie's | 1,379,393,850 | |
| Mouth of Totogatic drawn from Namekagon | 3,082,033,820 | |
| Total holding capacity | | 4,461,427,670 |
| Leaving a surplus of | | 8,184,214,570 |

From reservoirs full, for 90 days, can be furnished, per day, 49,571,418 cubic feet; per second, 573 cubic feet.

The surplus on the Namekagon may be reduced about 800,000,000 cubic feet by utilizing the holding-grounds at Namekagon Lake.

*Dam-site.*—Is located 4 miles above the mouth of the Namekagon and 1 mile below the mouth of the Totogatic, at the head of a stretch of rapids At this point, the high banks on either side approach to within 600 feet before breaking away into the valley of the Saint Croix, thus affording a very good site for a dam. The banks are composed of sand and gravel. The river bed is of the same material, to a depth of from 2 to 20 feet, proceeding from the right to the left banks. The substratum at this depth is a clay and gravel hard-pan. Upon gaining this information, it was deemed that a 40-feet rise of dam would not be impracticable. The river at this point has a width of 200 feet, and the valley, at 40-feet rise, a width of 600 feet.

### CHARACTER OF THE COUNTRY.

The source of the Namekagon is Lake Namekagon, situated in the southeast corner of Bayfield County, and near the divide in the watersheds of the Chippewa River and Lake Superior. They consist of numerous lakes, and extensive cedar and tamarac

marshes. From Namekagon Lakes to Veazie's the river is generally narrow and rapid, stretches of rapids over native trap-rock being frequent. There are also several vertical falls of from 2 to 4 feet. The banks are high on either side, stretching away into high broken ridges and sand barrens, covered with the various kinds of pine; hemlock and birch being found on the upper portions of the river. From Veazies to the mouth the river is from 100 to 200 feet wide, and in some cases attaining a greater width in passing over gravel bars. There are several sharp pitches and rapids, principal of which are "Little" and "Big Bull" Rapids, and "Dupee Flats." The river is navigable for small boats, such as batteaux and canoes, at a stage of 1 foot above low-water. The slope of the river is about 5 feet per mile.

Leaving Moore's Station, August 2, a line of levels was run from near Antoine Gordon's place through to Eau Claire Lakes, where a survey was made and holding-grounds found for the surplus on the Upper Saint Croix not held by dams. A dam-site was selected at the outlet of first Eau Claire Lake and above the old sluicing-dam. A rise of 12 feet was obtained for dam-site, which has a length of 220 feet. The banks consist of sand; the river bed being apparently sand and gravel. The holding-grounds comprise first and second Eau Claire Lakes, Cranberry Lake, and several marshes.

Results on Upper Saint Croix:

| | |
|---|---|
| Comprising that portion of the watershed above dam-site below Lake Saint Croix in section 35, town 44 north, range 13 west, 290 square miles | 8,084,736,000 square feet. |
| Annual rainfall | 25 inches. |
| Available rainfall | 0.7 foot. |
| | Cubic feet. |
| Supply from watershed | 5,659,315,200 |

Capacity of reservoirs:

| | | |
|---|---|---|
| Lake Saint Croix | cubic feet | 4,698,269,800 |
| Eau Claire Lakes | do | 961,045,400 |
| Total capacity of reservoirs | | 5,659,315,200 |

leaving no surplus.

From reservoirs full, for 90 days, can be furnished, per day, 62,881,280 cubic feet; per second, 728 cubic feet.

Second Eau Claire Lake has an elevation of 1,122 feet above sea-level. The lakes are surrounded by high banks. On the west they are gently rolling, while on the east and south the country is high and broken, the ridges being covered with pine, hemlock, and hard woods. Frequent outcroppings of the copper-bearing rock of Lake Superior are found. After completing this work, a line of levels was run through to Blackburn's Crossing on the Upper Totogatic, thence up the river to the sluicing-dam located in section 12, township 42, range 10 west, and about fifty miles above the mouth. A cross-section was made about fifty feet above the site now occupied by a dam. From this point sufficient examinations were made to determine the holding capacity of the valley and marshes above, and that a 12-foot dam will hold the supply of the watershed above this point. Our line of levels was continued through to Little Puckwawance, where connection was made with the line of levels run from Veazie's to this point by Assistant Davenport in the earlier part of the work. The dam-site has a length of 360 feet. The banks are clay and sand. A ledge of trap-rock exists about 1 foot below the river-bed, and above this rock is a deposit of loam, clay, and bowlders. We are enabled to show the following results on the Totogatic River:

| | |
|---|---|
| Area of watershed, 389 square miles | 10,844,697,600 square feet. |
| Annual rainfall | 25 inches. |
| Available rainfall | 0.7 foot. |
| | Cubic feet. |
| Supply from watershed | 7,591,288,320 |

Capacity of reservoirs:

| | |
|---|---|
| Upper Totogatic | 1,388,605,680 |
| Gilmore Lakes | 2,881,095,000 |

Mouth of Totogatic:

| | |
|---|---|
| Drawn from Totogatic River | 1,541,016,900 |
| Total holding capacity | 5,810,717,580 |
| Leaving a surplus of | 1,780,570,740 |

From reservoirs full, for 90 days, can be furnished, per day, 64,563,478 cubic feet; per second, 746 cubic feet.

The source of the Totogatic River is about 15 miles above the upper dam-site and between Eau Claire and Namekagon Lakes. The country is high and precipitous, especially on the north, toward the Totogatic-oance, the principal tributary of the Totogatic River. Through this region vast ranges of hills and cliffs extend for miles. Ledges of trap-rock, loose trap, and bowlders, are found in profusion.

Timber is of dense growth and consists of white pine; black, white, and yellow birch, hemlock, hard maple, elm, cedar, balsam, beech, and other species of smaller growth. There is a tradition among the Indians of the lake region that "Wani-Bajou," the aboriginal devil, inhabits this wilderness, which territory is considered by them as sacred to him.

*Dam-site.*—The dam-site is about 2 miles above the "Big Falls" (a vertical fall of 10 feet, over ledges of trap-rock). From this point to "Blackburn's," 10 miles distant, rapids are almost continuous, the stream not being navigable for boats of any kind. A canoe voyage was made from Blackburn's to the mouth of Totogatic for the purpose of exploring that portion of the river. The stage of water was about 1 foot above low-water, but too low for purposes of navigation. Our progress over rapids which were frequent was necessarily slow and frequent portages were necessary. Rapids are frequent and especially so from the dam-site near Gilmore Lake to the outlet of Driving Lake. The valley is narrow, being from 200 to 600 feet wide, with low bottoms, generally on one side, while the river runs near a high bank opposite. The stream is very crooked, doubling back and forth on its downward course. Arriving at the mouth of Totogatic after two days' voyage, a survey was made in this locality, of which previous mention has been made.

Upon the conclusion of this work a detached party, in charge of Assistant R. Davenport, was sent down the Namekagon and Saint Croix rivers with instructions to make examinations of the Upper and Lower Tamarac Rivers for holding-grounds. Of these streams Assistant Davenport says: "The Upper Tamarac enters the Saint Croix about 1 mile below the Wisconsin State line. The stream is small with a probable discharge of 15 cubic feet per second at ordinary stage of water. The valley passed through is generally wide and low, abounding in poplar and hard wood bottoms and tamarac marshes. The stream is very crooked, with frequent small rapids, and has a fall of 4 feet or more per mile. The only locality apparently suited for a dam-site is on the upper portion of the stream, where several small creeks come together, but, the area of water-sheds is so small as to make it of no practical value. The Lower Tamarac enters the Saint Croix some 10 miles below; is the larger of the two and has a probable discharge of 20 cubic feet per second. The valley is narrow, with high pine ridges on both sides. The stream is very crooked, with frequent small rapids and high banks. No suitable site for a dam or holding-ground is known on this stream."

The remainder of the party came through to Yellow Lake by land, where examination was made of the low grounds in the vicinity of Bass Lake, to ascertain the amount of dike, if any, necessary to raise the height of proposed dam at Yellow Lake. It was found that about 4,600 feet of dike, with the additional height of dam, would be required.

A line of levels was run from Marshland to Clam Lake, at which point a dam-site was chosen and survey made on a basis of 20 feet rise of dam. The holding-grounds are large, and by increasing the height of dam to 25 feet, which may be done with safety, the supply of the watershed may be held at this point.

*Dam-site.*—The site selected is one-half mile below the outlet of Clam Lake, and a short distance above Chase's sluicing-dam. Length of dam, 560 feet; height of dam, 25 feet.

The banks consist of sand, which appears to be the only material in this immediate vicinity. The river-bed is composed of sand to a depth varying from 3 to 20 feet, at which points soundings indicate a hard material, supposed to be clay and gravel. This, however, can only be determined by borings being made at this point.

RESULTS ON CLAM RIVER.

| | |
|---|---|
| Area of watershed, 283½ square miles | 7,903,526,400 square feet. |
| Annual rainfall | 25 inches. |
| Available rainfall | 0.7 foot. |
| | Cubic feet. |
| Supply from water-shed | 5,532,468,480 |
| Capacity of reservoir at 25 feet rise of dam | 4,670,786,500 |
| Surplus | 861,681,980 |

From reservoirs full for 90 days can be furnished, per day, 51,897,628 cubic feet; per second, 602 cubic feet.

The river above Clam Lake consists of the North and South Forks, each discharging about the same volume of water. At Clam Falls, the South Fork breaks over trap-rock ledges. Upon reaching the foot of the rapids below the falls the slope of the river is light, being about 2 feet per mile. The valleys of the streams are wide, with bottoms from 2 to 5 feet above low-water, extending from one-fourth to one-half mile on either side. Timber consists of hard and soft wood. A dense growth of under-brush covers the bottom-lands. Below the dam-site the river is very crooked, with no rapids, except one stretch just above the mouth.

The surveys on Clam River completed our operations in Wisconsin, except some further examinations on the Saint Croix in the vicinity of the mouth of Snake River.

At the conclusion of this work we proceeded to Pine City, on Snake River, about 14 miles above the mouth. Chengwatana dam is located on Snake River, two miles below Pine City, and just below Cross Lake. The dam is owned and operated by Mrs. Anna Munch, of Saint Paul. It is maintained wholly for sluicing logs, and furnishing water sufficient for driving them over Snake River Rapids and into the Saint Croix River. In case of low-water in the Saint Croix, water can be furnished by this reservoir to drive the logs to Taylor's Falls and to the lake below.

This is the most available point on Snake River for a reservoir. The dam consists of crib-work and stone, and has one 24-foot gate, six 14-foot gates, and one 8-foot gate, all of the Parker patent, and constructed for 9½ feet head. At this head the holding capacity of the reservoir is, in round numbers, one and seven-tenth billions cubic feet. By raising the head to 13 feet, which our examination proved feasible, the capacity will be more than doubled, or increased to three and seven-tenth billions cubic feet. More than 13 feet head cannot well be carried, as it would necessitate the construction of long dikes to protect the city from a partial overflow, and the overflow of valuable improved farming lands. Thirteen feet head will flow up the river to Brunswick, a distance of 24 miles, thereby flowing out Millett's Rapids—a short distance below Brunswick—which have a fall of 3½ feet in 1½ miles.

Examinations were continued up Snake to Ann and Knife rivers; small amounts of water may be held on these streams at sites which are now occupied by sluicing-dams. The amount held by these dams would probably not exceed 600,000,000 cubic feet, as the holding-grounds are small in every case.

The streams are narrow and rapid; the valleys admit of no holding-grounds, while the lakes are small, with low banks. Native trap-rock abounds in the bed of the streams. Examination of Ground-House River was also made. This is the largest tributary of Snake River, and enters 1 mile below Brunswick and just above Millett's Rapids. By putting in a 20-foot dam just below the forks of Ground House in section 7, township 38 north, range 24 west, there can be held upward of 1,000,000,000 cubic feet. Aside from this reservoir no holding-grounds of consequence were found.

RESULTS ON SNAKE RIVER.

| | | |
|---|---|---|
| Area of watershed above Chengwatana, 982 square miles | | 27,376,588,800 square feet. |
| Annual rainfall | | 25 inches. |
| Available rainfall | | 0.7 foot. |
| | | Cubic feet. |
| Supply from water-shed | | 19,163,612,160 |
| Capacity of reservoirs: | | |
| Ground-House | 1,045,440,000 | |
| Chengwatana | 3,703,238,000 | |
| Totol holding capacity | | 4,748,678,000 |
| Surplus | | 14,414,934,160 |

From reservoirs full for 90 days can be furnished, per day, 52,763,088 cubic feet; per second, 610 cubic feet.

Both sites are now occupied by dams. The probable cost of repairs and raising the head of the dam on Ground-House will be about $8,500.

The head of Chengwatana dam might be raised to 13 feet, at cost of $15,000. From Chengwatana to the mouth of Snake there is an average fall of 11 feet per mile over nearly continuous rapids of trap-rock, ledges, and bowlders.

Examinations were made on Kettle River and tributaries, with little hopes of finding holding-grounds for reservoirs. There are small holding-grounds on Moose, Willow, and Pine rivers, but in each case too small, or stituated too near the source of the stream, to be of value.

We found no holding-grounds on Kettle River. The river has an average fall of 6 to 8 feet per mile, over sharp pitches and long stretches of rapids. The banks are

high and precipitous and the valley narrow, admitting of no holding-grounds in itself. The ridges on either side are high and well supplied with pine and hard-wood timber. Examination of the Saint Croix Valley was made below the mouth of Snake and Kettle rivers for the purpose of obtaining holding-grounds for a portion of the large surplus on those streams. This was found to be impractiable, the valley being comparatively narrow, with bottoms rising rapidly to bluffs on either side. The slope of the river is very large, especially above the mouth of Snake. At the head of Kettle River Rapids on the Saint Croix, 2½ miles above the mouth of Kettle River, a cross-section for dam-site was made. Length, 2,500 feet; height of rise, 25 feet. The banks at this point consist of clay and sand, with trap-rock ledge for foundation. The slope of the river above the dam-site is about 2½ feet per mile.

This enables us to show the following results on the Saint Croix River above the dam-site at the head of Kettle River Rapids (called, in Table No. 1, Lower Saint Croix):

| | |
|---|---|
| Area of watershed, 2,962 square miles | 82,575,820,800 square feet. |
| Annual rainfall | 25 inches. |
| Available rainfall | 0.7 foot. |

| | Cubic feet. | |
|---|---|---|
| Supply from watershed | | 57,803,074,560 |
| Capacity of reservoirs: | | |
| Upper Lake Saint Croix | 4,698,269,800 | |
| Eau Claire Lakes | 961,045,400 | |
| Upper Totogatic | 1,388,605,680 | |
| Lower Totogatic | 1,541,016,900 | |
| Gilmore Lakes | 2,881,095,000 | |
| Veazies, (Namekagon) | 1,379,393,850 | |
| Lower (Namekagon) | 3,082,033,820 | |
| Mud Lake | 396,377,420 | |
| Rice Lake | 2,474,944,500 | |
| Yellow Lake | 3,402,712,000 | |
| Clam Lake | 4,670,786,500 | |
| Head of Kettle River Rapids | 2,709,500,000 | |
| Total holding capacity | | 29,585,780,870 |
| Surplus | | 28,217,293,690 |

We can then show the following results on the Saint Croix River as far as examinations have been made:

| | |
|---|---|
| Water-shed of the Saint Croix River above the mouth of Snake River, 5,012 square miles = | 139,726,540,800 square feet. |
| Annual rainfall | 25 inches. |
| Available rainfall | 0.7 foot. |

| | Cubic feet. | |
|---|---|---|
| Supply from watershed | | 97,808,578,560 |
| Capacity of reservoirs: | | |
| Dam-site at the head of Kettle River Rapids, and above that point | 29,585,780,870 | |
| From Snake River | 4,748,678,000 | |
| Total holding capacity | | 34,334,458,870 |
| Leaving a surplus of | | 63,474,119,690 |

From reservoirs full for 90 days can be furnished, per day, 381,493,987 cubic feet; per second, 4,415 cubic feet.

From surplus for 270 days can be furnished, per day, 230,814,617 cubic feet; per second 2,671 cubic feet.

This comprises all of the Saint Croix River watershed above the mouth of Snake River. From this showing we hold only 35 per cent. of the supply from one-third of the annual rainfall taken at 25 inches, thus leaving only 65 per cent. of the supply as available throughout the remainder of the year.

Appended hereto is a tabulated statement of the discharge of the different streams taken at dam-sites and other points, with stage of water when taken as near as could be determined from information at hand.

A list of existing sluicing-dams is also attached, showing such information as we were able to gain in regard to age, cost, capacity, and effect on the river below.

We show, also, a list of elevations at different points on the Saint Croix and tributaries, with slope per mile between points, and on the whole length of river examined. Those elevations marked approximate were arrived at, as near as possible, from other

level lines, slopes, and such other information as we were able to obtain. They are put in to assist in giving a general idea of the country gone over.

We also give tables showing the watershed above each dam in square miles and square feet, supply by each one-third and one-fourth the rainfall capacity of reservoirs, and amounts furnished per day and second for a period of ninety days.

TABLE V.—(SUMMARY.

| | Sq. miles. | Square feet. |
|---|---|---|
| Watershed of Saint Croix above the head of Kettle River Rapids | 2,962 | 82,575,820,800 |
| Watershed of Snake above Chengwatana | 982 | 27,376,588,800 |
| Total watershed tributary to reservoirs | 3,944 | 109,952,409,600 |
| | | Cubic feet |
| Supply by one-third rainfall = 0.7 foot | | 76,966,686,720 |
| Capacity of proposed reservoirs | | 34,334,458,870 |
| Surplus | | 42,632,227,850 |
| | Sq. miles. | Square feet. |
| To which add watershed of Snake below Chengwatana and the Saint Croix from mouth of Snake to dam above | 35 | 975,744,000 |
| Watershed of Kettle River | 1,033 | 28,798,387,200 |
| Total watershed above mouth of Snake not tributary to reservoirs | 1,068 | 29,774,131,200 |
| | | Cubic feet. |
| Supply by one-third rainfall = 0.7 foot | | 20,841,891,840 |
| Add further surplus | | 42,632,227,850 |
| Total surplus at mouth Snake | | 63,474,119,690 |

From reservoirs, full, can be furnished for 90 days, per day, 381,493,985 cubic fe et per second, 4,415 cubic feet.

This comprises all the watershed of the Saint Croix River and tributaries above the mouth of Snake River.

TABLE VI.

| | Sq. miles. | Square feet. |
|---|---|---|
| Watershed of the Saint Croix above head of Kettle River Rapids | 2,962 | 82,575,820,800 |
| Watershed of Snake above Chengwatana | 982 | 27,376,588,800 |
| Total watershed tributary to reservoirs | 3,944 | 109,952,409,600 |
| | | Cubic feet. |
| Supply by one-fourth rainfall = 0.52 foot | | 57,175,252,992 |
| Capacity of proposed reservoirs | | 30,347,860,578 |
| Surplus | | 26,827,392,414 |
| | Sq. miles. | Square feet. |
| To which add watershed of Snake below Chengwatana and the Saint Croix from mouth of Snake to dam above | 35 | 975,744,000 |
| Watershed of Kettle River | 1,033 | 28,798,387,200 |
| Total watershed above mouth of Snake not tributary to reservoirs | 1,068 | 29,774,131,200 |
| | | Cubic feet. |
| Supply by one-fourth rainfall = 0.52 foot | | 15,482,548,224 |
| Add former surplus | | 26,827,392,414 |
| Total surplus at mouth of Snake | | 42,309,940,638 |

From reservoirs, full, can be furnished for 90 days, per day, 337,198,448 cubic feet per second, 3,901 cubic feet.

This comprises all the watershed of the Saint Croix River and tributaries above the mouth of Snake River.

TABLE VII.

*Existing sluicing-dams on the Saint Croix River and tributaries.*

| | Head. | Width of gateway. | Holding capacity. | Number days driving. | Gate discharge. | Approximate cost of dam. | When built. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | *Ft.* | *Feet.* | *Cubic feet.* | | *Sq. ft.* | | | |
| Dam at Namekagon Lake. | 9 | 30 | 1,500,000,000 | 20 | 180 | $1,800 | 1869 | Generally fills to 6 feet head in eleven months. Filled to 9 feet head once in nine years. |
| Totogatic Dam | 9 | 30 | 1,250,000,000 | ..... | ..... | 1,180 | 1860 | Kept in good repair and might be utilized for holding its capacity. Only one of consequence on this stream. |
| Saint Croix Dam | 10 | 100 | ..... | 2½ | 450 | ..... | 1871 | This discharge raises water 1 foot on Kettle River Rapids 50 miles below. |
| Clam Lake Dam | 8 | 36 | 700,000,000 | ..... | ..... | 1,230 | 1877 | Dam in good condition; head cannot be raised except at great expense. |
| Mud Lake Dam | 7½ | 30 | 475,000,000 | 7 to 10 | ..... | 800 | ..... | With slight repairs can be utilized to hold its capacity. |
| Hector Dam | 7½ | 30 | ..... | 2 | ..... | 800 | .... | Holding-grounds small. |
| Rice Lake Dam | 10 | 30 | 700,000,000 | ..... | ..... | 2,200 | 1878 | Built in 1878. The head might be raised to 15 feet. |
| Yellow Lake Dam | 10 | 57 | 1,400,000,000 | ..... | ..... | 1,800 | 1869 | In poor condition; needs rebuilding. |
| First Eau Claire Dam. | 8 | 48 | 500,000,000 | ..... | ..... | 1,500 | 1867 | Of no account until rebuilt. |
| Third Eau Claire Dam. | 8 | 48 | 500,000,000 | ..... | ..... | ..... | 1872 | In good condition. |
| Puckwawance Dam | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Holding-grounds small. |
| Knife River Dam | 8 | 40 | ..... | 6 | 162 | 1,500 | ..... | Raises Snake River 15 inches. |
| Ann River Dam, 1 | 6 | 40 | ..... | 6 | ..... | 1,000 | ..... | Holding-grounds small. |
| Ann River Dam, 2 | 8 | 24 | ..... | 6 | ..... | 1,000 | ..... | Do. |
| Ground House Dam | 11 | 26 | 300,000,000 | 6 | 88 | 2,000 | ..... | Raises Snake River one-half foot. |
| Upper Snake River Dam. | 10 | 32 | ..... | ..... | ..... | ..... | ..... | Holding-grounds small. |
| Mud Creek Dam | 6 | 16 | 1,500,000,000 | ..... | ..... | 500 | ..... | Supply small; raises Snake River 3 inches. |
| Chengwatana Dam | 9½ | 116 | 1,689,819,200 | ..... | 396 | 6,300 | 1877 | Raises Saint Croix River 1.6 feet at Taylor's Falls. |

The sluicing-dams in Wisconsin are operated under charters granted by the State to private parties or corporations, generally for a term of fifteen years.

In Minnesota, dams for sluicing logs, timber, or lumber, are constructed and operated under a general license law passed by the State in 1861, which authorizes the county commissioners of the counties wherein dams are to be located to grant license, providing such dam is necessary at the point applied for, and that the land is in the possession of the parties applying therefor. Licenses may be granted for a period not exceeding six years, and renewed upon application. Bonds of not less than $1,000 required. Toll on logs, lumber, or timber, not to exceed 6 cents per 1,000 feet board-measure, except in the case of the Snake River dam (Chengwatana), which is allowed toll not exceeding 10 cents per 1,000 feet board-measure. Chengwatana dam was originally built and operated under a charter granted from the Territorial government.

The cost of dams as submitted in Table I, does not include cost of damage to property or the rights and franchises of private parties or corporations owning sluicing-dams at or near the points where our selections of dam-sites were made. In regard to the latter I think it would be a matter of small consequence, providing those parties were furnished with water for driving purposes to suit their convenience. In the case of the dam at Chengwatana, owned by Mrs. Anna Munch, of Saint Paul, a new dam at this point built of earth and stone, would cost about $30,000; whereas the present

dam, with repairs sufficient to raise the head to 13 feet, might be secured at a probable cost of $15,000, by giving the proprietors the same rights for sluicing logs and using water which they now have. This is a new dam and would answer every purpose at this point for ten years or more with the usual repairs which timber structures require. In submitting the cost of a dam at this point, however, I estimate $30,000; this being a safe estimate in either case. In regard to damage to property by overflow, at this time we are not provided with sufficient information to give an intelligent estimate.

In assuming one-fourth of the annual rainfall as available, dams at Eau Claire and Mud Lakes will not be required, and the cost of dams on Upper Saint Croix, Rice, and Clam Lakes will be materially reduced.

The list of existing sluicing-dams does not comprise all existing dams on the Saint Croix watershed, but those which were found as far as examinations were extended or likely to be of use in a system of reservoirs.

Thanks are due Mr. Charles Bean, of Hersey, Bean & Brown, Stillwater, for valuable information; also to Messrs. Munch Brothers, of Saint Paul, for like favors. To Assistants R. Davenport and G. W. Carrington, much credit is due for faithful and intelligent co-operation in the early accomplishment of the work.

Very respectfully, your obedient servant,

VINE D. SIMAR,
*Assistant Engineer.*

Maj. CHARLES J. ALLEN,
*Captain, Corps of Engineers, U. S. A.*

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## APPENDIX *b*.

### CHIPPEWA RIVER.

#### REPORT OF MR. ARCHIBALD JOHNSON, ASSISTANT ENGINEER.

ENGINEER OFFICE, UNITED STATES ARMY,
*Saint Paul, December* 24, 1879.

MAJOR: I have the honor to submit the following report of surveys made by me, under your direction, on the sources of the Chippewa River, for the purpose of estimating the capacity of reservoirs and the cost of creating and maintaining the same.

Pursuant to your instructions, I proceeded on the 9th of June to Chippewa Crossing, on the line of the Wisconsin Central Railroad, and arrived there on the 11th. This was made the initial point of the survey.

The first work to be done was to select a point on the grade at the south end of the railroad bridge, which was afterwards ascertained to be 920.5 feet above Lake Superior, or 1,522.5 feet above the sea-level, and from there run to Bear Lake two sets of levels, taking elevations of the water in the river at the head and foot of rapids whenever it was practicable to reach the river.

Besides this, a reconnaissance was made of the river. We started down the river on June 13. The river from Chippewa Crossing to the bend in section 34, township 42 north, range 2 west, consists of a series of small rapids, the fall varying from 1 to 3 feet. At the bend there is about 1 mile of sluggish water, but from there to the west side of section 20, township 42 north, range 2 west, it is again a series of rapids from 500 to 600 feet long, the fall being usually from 2 to 6 feet. From that point to the foot of Pelican Lake the fall is only 1.8 feet. At this locality a reservoir containing, perhaps, 500,000,000 cubic feet might be created; but as there were a sufficient number of other reservoirs ahead, of greater importance, to take up our time for the season, no survey was made.

From the foot of Pelican Lake to Bear Lake the river is again a series of rapids, between which are stretches of swift water varying from 1,000 to 4,000 feet in length. The river is from 50 to 125 feet wide, with banks from 5 to 20 feet high, while the ground rises back from the river 20 or 30 feet in one-half mile.

The drift from Chippewa Crossing to the existing dam below Bear Lake consists of a fine sandy loam somewhat impervious to water, and clay of a light reddish color, in which are invariably found numerous bowlders from 6 inches to 5 feet in diameter.

The swamps are usually peat, covered with a growth of tamarac, spruce, and cedar. The timber, taken in the order in which it predominates, consists of hemlock, white pine, tamarac, spruce, birch, balsam, maple, &c. At the east end of Bear Lake, and extending along on the north side of the river, is a windfall which occurred in 1867.

The elevation of low-water at Chippewa Crossing is 1,509.3 feet above the sea-level, the datum to which all elevations alluded to in this report are referred.

The elevation of low-water at Bear Lake and above the existing dam is 1,432.9 feet, making a fall of 76.4 feet from Chippewa Crossing to this point.

On June 19 we reached Bear Lake, which was the first reservoir surveyed. The elevation of low-water at the proposed dam-site is about 1,430 feet.

The reservoir has a watershed of 244.5 square miles, or 6,816,268,800 square feet.

The supply from one-third the rainfall, which for this region is assumed at 30 inches per annum, is 5,677,951,910 cubic feet. The superficial area of the reservoir is 117,631,476 square feet, equal to 4.2 square miles nearly, and its capacity is 1,113,148,856 cubic feet. Hence there will be a surplus of 4,564,803,054 cubic feet. Its capacity will give for 90 days 143.15 cubic feet per second. (See Table I.)

If one-fourth the rainfall is assumed as available, the supply will be 4,260,168,000 cubic feet, and the surplus 3,147,019,144 cubic feet, which will pass down to Little Chief Lake. (See Table II.)

The length of the dam will be 1,015 feet, and its maximum height 19.5 feet above low-water. It requires a dike 200 feet long, with a maximum height of 8.5 feet. The ground at the dam-site consists of clay of a light reddish color, mixed with gravel and bowlders; there are, also, gravel and bowlders in the bed of the river; and from indications below the existing dam, the clay must extend to a considerable depth below the bed of the river. The only way, however, in which this fact can be determined is by excavations. I do not consider it possible to make borings at this locality.

The water in the reservoir will be confined principally to the lake itself, and to adjacent swamps, which are peat, and on which is a dense growth of tamarac, spruce, and white cedar, varying from 2 to 6 inches in diameter. Where hard ground is flooded, the ground, as already described, consists of sandy loam and clay. These two classes of soils are sometimes found in strata, sometimes in distinct masses, and sometimes running into one another without any regularity, the clay as a rule, however, largely predominating. The pine within the limits of the reservoir, as well as for a considerable distance beyond, has been cut over once or twice and there is not much left that will be damaged by water.

At the proposed dam-site there is plenty of materials for the construction of a wooden dam.

### DESCRIPTION OF THE EXISTING DAM BELOW BEAR LAKE.

This dam was constructed in August and September, 1877, by the Chippewa River Improvement Company, at a cost of $5,500. It is what is termed a flooding dam, and the object of it is, as well as of all others of its class, to store up water, and create what is termed a driving stage for logs by suddenly raising the gates. Its capacity is about 300,000,000 cubic feet, and requires about a month to fill during the low-water season. It has a water-way of 42 feet, and is built for a 10-foot head. There are four sliding gates, two of them 7 feet by 10 feet, and two 8 feet by 10 feet. There is also a sluice-way controlled by stop plank, 12 feet by 10 feet. The gates are raised by means of iron levers applied to cast-iron racks on the rear and lower sides of the gates. The planks are raised by means of a wooden windlass directly over the plank. The entire length of the dam is 574 feet. In looking at the dam from the south end there is, first, the left wing, 150 feet long; then a pier 36 feet long, 8 feet wide, and 12 feet high; then a sluice-way, 7 feet wide and 10 feet deep; next a plank partition 1.5 feet wide; again a sluice-way 8 feet wide and 10 feet deep; next a pier with an ice-breaker 36 feet long, 7 feet wide, and 12 feet high; then a sluice-way, 12 feet wide by 10 feet deep; again a pier 36 feet long, 7 feet wide, and 12 feet high; next a sluice-way 8 feet wide and 10 feet deep; then another partition 1.5 feet wide; next a sluice-way 7 feet wide and 10 feet deep; and again a pier 36 feet long, 7 feet wide, and 10 feet deep; lastly, the right wing, 350 feet long. These piers are said to rest on a foundation of clay, gravel, and brush, and are built of square timber and filled with rock. For the wings a cob work of long and heavy round logs is built up, the front of which is vertical, while the rear or upstream part has a slope of about 1½ feet horizontal to 1 foot vertical to receive the covering, which is also of round logs from 12 to 14 inches in diameter. The foot of this covering simply rests on the ground, and is protected by a backing of clay, gravel, and brush. There is no covering in front of the wings, as the water is never allowed to flow over the dam.

Whenever the water rises to the top of the dam a gate is raised. Below the piers there is an apron 50 feet long; and in line with the main piers there are low piers on this apron about 3 feet high, and filled with rock. These are put in so that when all the gates are not open the water will not spread out on the apron. There is a great deal of leakage at this dam, and it would seem as if it would not last very long.

The survey of Bear Lake was finished on July 12.

Levels were next run to Little Chief Lake, which was the next reservoir surveyed. Levels were taken at the head and foot of the principal rapids. From Bear Lake to Little Chief Lake the river is very treacherous, and unsafe for canoes or bateaux, when it is above an ordinary stage, on account of rocks, and sharp bends in the river. The worst of these are Cedar Rapids and Snaptail Rapids. Cedar Rapids are about 3

miles long, commencing about 2 miles below the proposed dam-site at Bear Lake, and ending at the southwest corner of section 10, township 40 north, range 4 west, the fall being about 54 feet. From Blaisdell's Lake (see general map) to the head of Snaptail Rapids the river has a gentle current. Snaptail Rapids are about 1½ miles long, and end at Hunter's Lake, having a fall of 45 feet in that distance.

At Blaisdell's Lake a small reservoir might be created holding about 250,000,000 cubic feet of water, but having considered it too small it was not surveyed.

The country along the river from Bear Lake to Little Chief Lake is timbered with hemlock, white pine, tamarac, spruce, cedar, birch, balsam, &c. On the south side of Hunter's Lake there is an old wind-fall which occurred in 1872, stretching to the southwest, and northeast to Lake Superior.

The banks of the river from Bear Lake to the foot of Little Chief Lake vary from 4 to 50 feet high.

The ground along Hunter's Lake and Little Chief Lake, sometimes known as Barker's Lake, is from 35 to 60 feet high. The drift consists of sandy loam and a light reddish clay mixed with bowlders. It is what is termed a rocky soil. The swamps are peat and are covered with a dense growth of tamarac, spruce, and cedar.

Little Chief Lake reservoir has a watershed of 57.6 square miles, equal to 1,605,795,840 square feet. The superficial area is 46,781,532 square feet, equal to 1.6 square miles, nearly. Its capacity is 771,332,009 cubic feet. The available supply from one-third the rainfall is 1,337,627,935 cubic feet. Hence the surplus from its own watershed is 566,295,926 cubic feet. Adding to this the surplus from the Bear Lake reservoir, for one-third the rainfall, we have a total surplus of 5,131,098,980 cubic feet. (See Table I.)

Assuming one-fourth the rainfall as available, there is a surplus of 232,290,391 cubic feet. Adding to this the surplus from the Bear Lake reservoir for one-fourth the rainfall, and there is a total surplus of 3,379,309,535 cubic feet. (See Table II.) The reservoir will give a supply for 90 days of 99.19 cubic feet per second.

The proposed dam-site is located at the head of a series of rapids which extend down to the confluence of this branch with the West Fork.

The banks at the dam-site consist of sandy loam, clay, and bowlders. On the bed of the river and on the low ground there is a thick layer of bowlders, below which there is evidently the usual clay or perhaps rock.

The total length of the dam is 710 feet, and its maximum height above low-water 24 feet. The pine within the limits of this reservoir has been mostly cut, but there is an abundance left for all purposes of construction, and rock for pier filling is quite convenient.

The water in this reservoir will be confined chiefly to the lakes and adjacent swamps. The elevation of low-water at the dam-site is 1,323.4 feet, hence the total fall from Chippewa Crossing to that point is 185.9 feet.

The survey of Little Chief Lake reservoir was completed August 1. Levels were next run across from Little Chief Lake to the proposed dam-site on the West Fork of the Chippewa River. The elevation of that point is 1,285 feet. The fall from Little Chief Lake to the confluence of the East and West Forks is about 43 feet in a distance of 2¾ miles. The river between those points is a series of rapids, and the bed of the river is literally paved with bowlders. The banks are from 10 to 20 feet high, and the drift a reddish clay. Between the junction of the East and West Forks to the proposed dam-site at Pa-kwa-wang there is a swift current. There are several gravel bars, but no rapids.

We reached Pa-kwa-wang on August 2.

The Pa-kwa-wang reservoir has a watershed of 257.2 square miles, equal to 7,170,324,480 square feet. The supply from one-third the rainfall is 5,972,880,292 cubic feet. Its capacity is 7,692,997,229 cubic feet. The deficiency is received from the watershed to the Moose Lake reservoir, which is above this on the West Fork and has a large surplus. (See Table I.)

Its surface area is 580,578,192 square feet, equal to 20.8 square miles nearly. The surplus from one-third the rainfall received from the Moose Lake reservoir, and passing through this, is 1,234,725,814 cubic feet. (See Table I.) This reservoir will furnish, for 90 days, 989.33 cubic feet per second.

From one-fourth the rainfall, after filling the Moose Lake reservoir, there will be a deficiency of 1,499,364,631 cubic feet. This deficiency may be received from the East Fork and still leave a surplus passing the dam at Little Chief Lake of 1,879,944,904 cubic feet. This will require a 25-foot dam at Little Chief Lake. The water will pass across from the southwest bay of the lake. (See A on general map.) The discharge, without making up the deficiency, will be, for 90 days, 796.5 cubic feet per second. (See Table II.)

The water in this reservoir will be confined principally to the river, swamps, and marshes. A few points of hard land will, however, be flooded, the soil of which consists of sand, sandy loam, and clay.

The timber on the hard ground on the east side of the West Fork, and on the west side of the river for a mile above the proposed dam-site, and again commencing about

a mile above the mouth of Little Chief River, consists of hemlock, white pine, tamarac, spruce, birch, balsam, &c. With this exception, the timber on the hard ground within the limits of this reservoir, and for several miles to the north and south of Little Chief River, consists of scattering Norway and white pine, usually damaged by fire. There are also numerous patches of poplar brush which has sprung up after fires. The ground to the north and south of Little Chief River is high and broken, rising sometimes 50 or 75 feet above the marshes bordering on the river.

The water in Little Chief River, in its tributaries and surrounding lakes, is clear spring-water, and is derived from the high ground surrounding, which is usually sand and sandy loam. In sections 14, 15, 21, 22, 23, township 40, range 7, there is a floating bog, which rises and falls with the river, which has scarcely any timber. (See general map.)

On the swamps there is a dense growth of spruce and tamarac, from 2 to 6 inches in diameter. The swamps are peat. The ground at the proposed dam-site, as already described, is clay and sandy loam. The bed of the river is coarse gravel, sand, and clay.

The West Fork of the Chippewa from the proposed dam-site to the mouth of Little Chief River is sluggish, there being only 1.5 feet fall in that distance. From there to the limit of flowage it consists of a series of rapids and still reaches, sometimes three-fourths of a mile in length. Little Chief River and its tributaries in some places have a strong current, but usually the current is sluggish. Along these streams, as well as from the mouth of Little Chief River to the proposed dam-site, there are extensive rice fields and meadows.

This reservoir lies mostly within the reserve for the Courtes-Oreilles band of Chippewa Indians. These Indians have selected lands within the limits of the reserve for farms and have been supplied by the government with farming implements. I have been informed that adults, both male and female, are entitled to 80 acres of land, and that those who have selected homesteads and made the necessary improvements are expecting to receive their patents this year. Their farms so far extend along the West Fork from the proposed dam-site to the mouth of Little Chief River, and again on the west and south sides of Chief Lake.

The length of the proposed dam is 900 feet, and maximum height above low-water 25.5 feet.

I have been informed that it is the intention of the Mississippi River Logging Company to construct a 16-foot dam this winter about 1,000 feet above the proposed dam-site here.

There are two small existing dams within the limits of this reservoir; one is located at the mouth of the outlet to Pokegama Lake and the other on Little Chief River at the northeast corner of section 26, township 40 north, range 7 west. The one at Pokegama Lake has a sluice-way 8 feet wide and 8 feet deep controlled by a sliding gate. Each wing is about 50 feet long with the covering sloping. Its construction is similar to that at Bear Lake. The dam on Little Chief River is 142 feet long and there are three sluice-ways, each 8 feet wide and 6 feet deep, controlled by sliding gates. The right wing is 37 feet long and the left 77 feet.

Instead of piers at the sluices there are partitions formed by planking rectangular frames resting on the floor of the sluices. The covering of the wings slope up stream and rest on cob-work of round logs as at Bear Lake. The toe of the dam is first protected by driving sheet piles at the foot of the covering and in front of the sluices, and as an additional security there is a backing of clay and sandy loam.

There is a difference of 1 foot between the water above and below the dam. This dam creates a driving stage for logs out of the valley of Little Chief River and down the West Fork as far as the mouth of the East Fork. It cost $500 and was built in May.

The survey of this reservoir was completed September 6.

Levels were now continued up the West Fork to Moose Lake, where the next reservoir was surveyed. We reached that point on September 9.

The elevation of low-water below the existing dam there is 1,358.8 feet, and above the dam 1,361.9 feet. The proposed dam-site is 100 feet above the existing dam, and low-water is assumed at 1,358.8 feet.

The West Fork of the Chippewa, from the mouth of Little Chief River to Moose Lake, is a series of rapids, between which are stretches of sluggish water. The banks are generally from 10 to 30 feet high.

The timber along the river is mostly white pine and hemlock. Lumbering has been carried on along this portion of the river for a great many years, and close to the river there is not much pine of a good quality left. The soil is usually clay.

The area of the watershed of the Moose Lake reservoir is 214.3 square miles, and the supply from one-third the rainfall, which has been assumed at 30 inches, is 4,976,626,153 cubic feet, and its capacity is 2,021,783,402 cubic feet. Hence, after supplying the deficiency of water from the watershed of the Pa-kwa-wang reservoir for that dam, there is still a surplus of 1,234,725,814 cubic feet to pass down river. (See

Table I.) Its supply from one-fourth the rainfall is 3,733,963,200 cubic feet, and the surplus of 1,712,179,798 cubic feet, goes into the Pa-kwa-wang reservoir and is there stored. (See Table II.) The surface area of the reservoir is 137,844,396 cubic feet, or 4.9 square miles nearly. The reservoir will give a supply of 260 cubic feet per second for a period of 90 days. The water in the reservoir will be confined chiefly to Moose Lake and adjoining swamps. It also extends up the West Fork to Partridge Crop Lake, but does not flood it any. The river from the proposed dam-site to Partridge Crop Lake consists of short and steep rapids and gravel-bars, their length being from 200 to 600 feet, having a fall from 2 to 6 feet. Between these rapids there are still reaches where the river is from 200 to 400 feet wide and the bottom soft. Beyond Partridge Crop Lake and to the source the river is from 20 to 50 feet wide, the river being sluggish. Occasionally there is a gravel bar when there is a fall of about 2 feet, but there are no rapids. The river above the proposed dam-site is confined between banks which are from 20 to 30 feet high and the timber is mostly white pine and hemlock, the pine predominating.

Partridge Crop Lake is the farthest point upstream where pine has been cut. At the inlet to Moose Lake there is an extensive windfall, both on the hard ground and in the swamps which has been burned over. The timber around Moose Lake consists of hemlock, white pine, birch, tamarac, cedar, spruce, and balsam. The ground around Moose Lake is from 50 to 100 feet above the lake, considerably broken with short ravines making down to the lake. The ground consists of clay, gravel, and sandy loam. At the dam-site the bed of the river and the low ground is a mass of bowlders from 6 inches to 3 feet in diameter. The existing dam is said to rest on a ledge of rock, but there is no outcropping of rock visible anywhere in the vicinity. The total length of the proposed dam is 1,235 feet, and maximum height above low-water 25.7 feet. The total length of dike is 160 feet, and maximum height 1.5 feet.

For the construction of a wooden dam there is plenty of pine timber convenient; also rock for pier-filling. No borings can be made at the dam-site on account of bowlders or rock in place.

### DISCRIPTION OF EXISTING DAM AT MOOSE LAKE.

This is a flooding dam and is located at the head of a stretch of rapids and about 100 feet below the proposed dam-site. The dam is 347 feet long, and the head 7 feet. There are two sluice-ways, one 8 feet wide and 7 feet deep, controlled by a sliding gate, and one 16 feet wide, controlled by stop-logs. There are no piers, but the ends of the wings are faced with solid walls of 12 by 12 inch timber, and between the sluices there is a partition formed by planking a rectangular frame secured to the floor of the sluices and at the top to cross-pieces connecting the walls at the wings. In this partition and in the walls, are slots for the gate and stop-logs. The wings are formed by placing round timbers, on a slope of 1½ feet horizontal to 1 foot vertical, and allowing them to rest on a cob-work of heavy round logs.

The toe of the covering, as well as in front of the sluices, is protected by a backing of gravel and clay.

This dam is out of repair both at the sluices and at the south wing. At the south wing there is a break of 50 feet.

The reservoir from this dam has a capacity of about 430,000,000 cubic feet, and affords a driving stage for logs for about 12 days, as far at least as the mouth of the East Fork. It is owned by a Mr. Goodrich and was built in 1877 at a cost of $1,500.

There is another dam on the West Fork about a mile below Partridge Crop Lake. The south wing is 52 feet long and the north 59 feet long. It has but one sluice-way, 12 feet wide and 8 feet deep, and controlled by stop-logs. At the ends of the wings there are solid walls of timber, hewn on three sides, in which is a slot for stop-logs. The covering has a slope of about 1 to 1 and rests on a cob-work of round logs. The rear of the dam is protected by a backing of clay and gravel.

A small reservoir might be created at Crop and Lost Lakes, but the watershed being only 33 square miles it was considered too small to survey.

The survey of Moose Lake reservoir was completed on September 30.

We next moved camp to Lake Courtes-Oreilles by way of Little Chief River and Chief Lake.

Levels were now run from Chief Lake to Lake Courtes-Oreilles, where we arrived on October 5. The elevation of Courtes-Oreilles is 1,287.2 feet; that of Grindstone, 1,287.6 feet; Fish Lake, 1,288.3 feet; Island Lake, 1,292 feet; and of Sand Lake, 1,301.1 feet. For the elevation of the other smaller lakes see general map. The elevation of low-water at the dam-site is 1,287.2 feet.

The Courtes-Oreilles reservoir has a water shed of 114 square miles, equal to 3,178,137,600 square feet. For one-third the rainfall its supply is 2,647,388,621 cubic feet, and the entire amount may be stored in itself. The superficial area of the reservoir for its own water will be 448,582,620 square feet, equal to 16.1 square miles, nearly.

The length of dam will be 260 feet, and height above low-water 6.5 feet. There will

be no dike, but a tamarac swamp, which seems to have been an old channel, will require, for a length of 100 feet, sheet piling 6 feet in length. For 90 days it will deliver 340.45 cubic feet per second. (See Table I.) The water within the limits of the reservoir will be confined wholly to lakes and small swamps. For one-fourth the rainfall the supply will be 1,986,336,000 cubic feet, which can be stored with a 5-foot dam above low water.

The superficial area of the reservoir will be 435,756,814 square feet, equal to 15.6 square miles, nearly. The length of the dam will be 260 feet, as before, and sheet piling for a distance of 100 feet, and 5 feet long. Under this condition the reservoir will supply for 90 days, 255.44 cubic feet per second. (See Table II.)

Now, instead of allowing any surplus water to pass Little Chief Lake, by constructing a 25-foot dam at that reservoir, the water may be passed over into the Pa-kwa-wang reservoir (see black dotted line marked A, on general map), and from there, together with the surplus from the West Fork, through a canal into Lake Courtes-Oreilles. This excavation amounts to 264,700 cubic yards of earth, and would probably cost about $52,940. (See profile attached and black dotted line marked B, on general map.) Now, supposing one-third the rainfall is available, this will give us in Courtes-Oreilles reservoir 9,013,213,415 cubic feet, which, for 90 days, will give 1,159.16 cubic feet per second. This will require a 20-foot dam above low-water. Its length will be 415 feet. It will also require a dike 2,850 feet long, and a maximum height of 13.5 feet.

The superficial area of the reservoir will be 496,781,760 square feet, equal to 17.8 square miles, nearly. (See Table III.)

Now, suppose that one-fourth the rainfall is available, we have for Courtes-Oreilles reservoir, 3,366,280,904 cubic feet. This will require a dam 9.4 feet in height above low-water. Its length will be 297 feet. The length of dike will be 148 feet, with a maximum height of 3 feet.

The superficial area of the reservoir will be 449,000,000 square feet, equal to 16.1 square miles, nearly. Its supply for 90 days, will be 497.21 cubic feet per second. (See Table IV.)

On the east, south and west sides of Lake Courtes-Oreilles the hard ground is timbered with scattering Norway pine, jack-pine, scrub-oak, and poplar brush. On the swamps there is a heavy growth of tamarac from 4 to 8 inches in diameter. On the north and west sides of Grindstone Lake the timber is white pine, Norway pine, maple, birch, and tamarac. On the northeast and north sides of Fish Lake, and on the north and west sides of Sand Lake, the timber is scattering Norway pine and poplar brush. On the south side of Fish and Sand Lakes the timber consists of poplar, maple, birch, tamarac, balsam, &c. The ground on the east, south, and west sides of Lake Courtes-Oreilles consists of sand, sandy loam, clay, and gravel; also, on the north side of Fish and Sand Lakes. Around Grindstone and Island Lakes, and on the southwest side of Fish Lake, and south side of Sand Lake, the ground is clay and sandy loam. The ground in the vicinty of this reservoir varies from 20 to 70 feet in height above the water. The ground at the dam-site is clay, gravel, and sandy loam. The bed of the outlet at the dam-site consists of clay, gravel, and sand. The lakes usually have either a clay or gravel beach.

For pier-filling plenty of rock can be found along the lake shore. In looking at the general map it will be seen that there are but few streams emptying into it. Owing to the clearness of the water, the lakes are evidently largely supplied by spring water. It seems apparent, however, from the small discharge in the river, that the rain absorbed in the ground, particularly on the western side of the reservoir, does not find its way into this reservoir, but seeks an outlet to the west, in which direction the country is falling. One-fourth the rainfall ought to be considered here, when one-third may in the other cases be used. The most of this reservoir lies within the reserve for the Courtes-Oreilles band of Chippewa Indians. As at Pa-kwa-wang the Indians have selected homesteads and are farming on a small scale.

There will be very little land damaged, either by a 6.5-foot dam or by a 20-foot dam, as there is no wild rice within the limits of the reservoir, and very little meadow land. The green line on the general map and the red line beyond where it joins the green is the flowage-line for a 20-foot dam, and the red line alone for either a 5 or 6.5 foot dam.

The survey of the Courtes-Oreilles reservoir was completed on October 25.

We next proceeded by boat down the Courtes-Oreilles River and main Chippewa as far as Big Bend. As a matter of economy we left our boats at Big Bend, and traveled by stage to Chippewa Falls, and from there to Paint Creek, where the next and last reservoir was surveyed. We arrived there on October 29.

Courtes-Oreilles River is from 50 to 60 feet wide. The first 3 miles of it is sluggish, but from there to the mouth it is a series of rapids and still reaches. The worst of these rapids is known as Courtes-Oreilles Falls. The river at this point passes through a granite formation. The falls are situated within 3 miles of the mouth of the river. Courtes-Oreilles River is not navigable for bateaux at extreme low-water on account of rocks and gravel-bars.

The Chippewa River, from the mouth of the Courtes-Oreilles River to Big Bend, has a swift current the entire distance, and no rapids of any consequence.

Paint Creek reservoir has a superficial area of 58,806,566 square feet, equal to 2.1 square miles. It has a watershed of 3,493.1 square miles, equal to 109,927,319,040 square feet. The supply from one-third the rainfall is 91,569,456.760 cubic feet. The capacity of the reservoir is 505,336,720 cubic feet. Hence the surplus is 91,064,120,040 cubic feet. It will furnish a supply of 64.99 cubic feet per second for 90 days.

The following tables—I, II, III, IV—show the areas of watersheds and reservoirs supply from *one-third* or *one-fourth* the rainfall; capacities and supply per second for 90 days; also cost of dams. Table V shows discharge of streams.

Assuming *one-third* the rainfall as available, and allowing the surplus from the East and West Forks of the Chippewa River, and the surplus from Butternut Lake, Rest Lake, Bear Creek, Round Lake, Squaw Lake, and Park Lake to pass down river, there will be a surplus passing the Paint Creek dam—which is the lowest dam on the Chippewa waters—of 102,148,325,526 cubic feet. The quantity of water stored in the reservoirs will give a supply of 3,245.79 cubic feet per second for 90 days. (See Table I.) Again, supposing that the surplus from the East and West Forks is allowed to pass through a canal into Lake Courtes-Oreilles, there will be a surplus passing Paint Creek of 95,782,500.732 cubic feet. The quantity of water stored will give a supply of 4,064.50 cubic feet per second for 90 days. (See Table III.) Assuming that one-fourth the rainfall is available, and allowing the surplus from the East Fork of the Chippewa to pass down river, there will pass at Paint Creek a surplus of 74,101,054,095 cubic feet. The supply under this condition will be, for 90 days, 2,784.42 cubic feet per second. (See Table II.)

Lastly. Assuming that the surplus from the East and West Forks is directed into Pa-kwa-wang and Courtes-Oreilles, there will be a surplus passing Paint Creek of 70,721,744,560 cubic feet. The water stored will give a supply for 90 days of 3,219.02 cubic feet per second. (See Table IV.)

In the vicinity of Paint Creek reservoir the hard ground is usually of a sandy nature. The swamps seem to be muck. The timber consists of scattering white and Norway pine, tamarac, and scrub-oak.

There is no land within the limits of the reservoir that is cultivated, for the reason that it is not worth cultivating. There is an existing dam across the Chippewa River at the proposed dam-site, and certain lands along the river have already been condemned.

The proposed dam may be built over the one now existing. Its length will be 620 feet, and height 22 feet above low-water.

TABLE OF ELEVATIONS OF IMPORTANT POINTS WITHIN THE LIMITS OF THE SURVEY ABOVE THE SEA-LEVEL, AT LOW-WATER.

| | Feet. |
|---|---|
| Low-water at Chippewa Crossing | 1,509.3 |
| Bear Lake | 1,432.9 |
| Proposed dam-site at Bear Lake | 1,430.0 |
| Head of Cedar Rapids | 1,420.0 |
| Foot of Cedar Rapids | 1,337.5 |
| Head of Snaptail Rapids | 1,368.8 |
| Foot of Snaptail Rapids | 1,325.2 |
| Hunter's Lake | 1,325.2 |
| Little Chief Lake | 1,323.4 |
| Proposed dam-site at Little Chief Lake | 1,323.4 |
| Proposed dam-site at Pa-kwa-wang | 1,285.0 |
| Chief Lake | 1,295.7 |
| Proposed dam-site at Moose Lake | 1,338.8 |
| Moose Lake | 1,361.9 |
| Partridge Crop Lake | 1,384.8 |
| Summer Lake | 1,396.1 |
| Crop Lake | 1,384.8 |
| Lost Lake | 1,385.0 |
| Lake Courtes-Oreilles | 1,287.6 |
| Island Lake | 1,292 |
| Little Court, Oreilles Lake | 1,286.4 |
| Fish Lake | 1,288.7 |
| Sand Lake | 1,301.1 |
| Little Sand Lake | 1,303.8 |
| Flat Lake | 1,320.3 |
| Proposed dam-site at Lake Courtes-Oreilles | 1,287.2 |
| Pokegama Lake | 1,290.5 |
| Crane Lake | 1,300.7 |

The following is a list of existing dams, operated by private parties, on the Chippewa River and its tributaries, *within the limits* of our survey:

1. *Goodrich's dam*, on the West Fork, situated in the southwest quarter of the southwest quarter of section 32, township 42 north, range 5 west:

| | | |
|---|---|---|
| Height of stop-plank above foundation | feet.. | 8 |
| Width of sluice-way | do... | 12 |
| Length of dam | do... | 123 |
| Dead-head | do... | 3 |

2. *Goodrich's dam*, on West Fork of Chippewa River, near mouth of Moose Lake, situated in the northeast quarter of the southeast quarter of section 14, township 41 north, range 6 west:

| | | |
|---|---|---|
| Height of sluice-ways above flooring | feet.. | 7 |
| Total width of sluice-ways | do... | 24 |
| Length of dam | do... | 347 |
| Dead-head | do... | 2.1 |
| Capacity | cubic feet.. | 430,000,000 |

3. *Dam on outlet to Pokegama Lake*, situated in the northwest quarter of the northwest quarter of section 32, township 40 north, range 6 west:

| | | |
|---|---|---|
| Height of sluice-way above floooring | feet.. | 8 |
| Width of sluice-way | do... | 8 |
| Length of dam | do... | 108 |

4. *Haywood's dam*, on Little Chief River, located in the northeast quarter of the northeast quarter of section 26, township 40, range 7 west:

| | | |
|---|---|---|
| Height of sluice-way above flooring | feet.. | 6 |
| Width of sluice-way | do... | 24 |
| Length of dam | do... | 142 |
| Dead-head | do... | 1 |

5. *Chippewa River Improvement Company's dam at Bear Lake*, on East Fork, situated in the northwest quarter of southeast quarter of section 26, township 41 north, range 4 west:

| | | |
|---|---|---|
| Height of sluice-ways above flooring | feet.. | 10 |
| Width of sluice-ways | do... | 42 |
| Length of dam | do... | 564 |
| Capacity | cubic feet.. | 300,000,000 |

6. *Little Falls dam*, situated in southeast quarter of the northwest quarter of section 28, township 32, range 6:

| | | |
|---|---|---|
| Height of sluice-ways above flooring | feet.. | 21 |
| Total width of sluice-ways | do... | 267 |
| Length of dam | do... | 625 |
| Dead-head | do... | 5 |
| Capacity | cubic feet.. | 133,333,333 |

7. *Paint Creek dam*, situated in the southeast quarter of the northwest quarter of section 3, township 28 north, range 8 west, on the Chippewa River:

This is a rolling-dam, with a log-way 100 feet wide at the center, and near the right bank a lumber slide 23 feet wide.

| | | |
|---|---|---|
| Crest of dam above low-water | feet.. | 10½ |
| Total length of dam | do .. | 526 |

DESCRIPTION OF DAM ACROSS THE CHIPPEWA RIVER AT PAINT CREEK.

This dam is situated in the southeast quarter of the northwest quarter of section 3, township 28 north, range 8 west, at the proposed dam-site for the Paint Creek reservoir. In looking at the dam from the right bank of the river there is first a shore-pier of crib-work 17 by 37 feet, and filled with rock. The top of this pier is about 30 feet above low-water, and was built to that height with a view to raising the present dam 12 feet. Then comes a crib-work of timber, the top of which is 18.5 feet above low-water, 100 feet long and filled with stone; next in order is the right pier of the lumber slide, 10 feet wide and 206 feet long, then the lumber slide 23 feet wide. This has an adjustable apron at the upper end, the crest of which is 8 feet above low-water when it is down. At the lower end is a floating apron. Next in order is the left pier, with an ice-breaker. The upper portion of it, for a distance of 80 feet, is 16 feet wide, and the remainder, 126 feet, is 10 feet wide. The upper ends of these piers are about 19 feet above low-water, and lower by steps as we approach the end of the slide. Then

comes the rolling dam, 360 feet long, in the center of which is a roll-way for logs, about 100 feet wide. The covering in the rear of the dam has a slope of about 1½ feet horizontal to 1 foot vertical. In front of the dam the covering has a slope of about 1 to 1, with the exception of the roll-way, where the slope is about 4 feet horizontal to 1 foot vertical. This covering rests on crib-work of timber and filled with rock. The toe of the dam is protected by a backing of sand and gravel. The bottom of the river at this place is a granite formation, the planes of cleavage of which are at an angle of about 15° from the vertical. The granite in this vicinity seems to be of a good quality and is used as a building stone.

In looking at the general map, it will be seen from elevations of different points within the limit of our survey that the country, besides falling to the southwest, also falls to the west along the summit. The elevation of low-water at Chippewa Crossing is 1,509 feet above the sea level, but the headwaters of Bad River is about 1,600 feet above the sea, and there are points on the Penokee Iron Range which are over 1,700 feet. It is a common opinion among persons who have spent considerable time at various points in Northern Wisconsin that the rainfall is more than in the southern part of the State, and I am satisfied that when the mean annual rainfall is ascertained for this region it will not be far from 36 inches.

Northern Wisconsin is still a vast wilderness, and from the progress that emigration has made into that portion of the State since it was opened by the Wisconsin Central Railroad, it promises to remain so for twenty or thirty years to come. This is partially owing to the labor required in clearing up the land, but more especially to the fact that the clay soil which predominates in that region is generally impervious to water. Besides this, rocks are so common in the soil that the lands are not desirable for farming purposes. Even in swamps we almost invariably find bowlders and gravel at the bottom. Hence, it is difficult to see where the existence of reservoirs in this region will interfere either directly or indirectly with agricultural interests.

In regard to damages to water-power for mill-sites, it is not probable that lumber will ever be manufactured in this region, for the reason that the market for the lumber of the Chippewa Valley is in the Mississippi Valley, and until we reach the vicinity of Chippewa Falls it would be impossible to run lumber without going to an unwarrantable expense. In view of the above considerations the reservoirs will not be detrimental to the manufacture of lumber. The only cause of complaint that could arise, providing that the lumbering interests were made subservient to the interests of commerce in the Mississippi Valley, is, perhaps, a delay of one or two months in getting the drives to their destination at Chippewa Falls, Eau Claire, and points below. But when we consider that during winters, when the fall of snow is very small, the lumbering interests are embarassed during the entire season following, as was the case on the Chippewa in 1878, a delay of a month or two is only a guarantee, in the end, of successful operations during each season.

Very respectfully, your obedient servant,

ARCHIBALD JOHNSON,
*Assistant Engineer.*

Maj. CHARLES J. ALLEN,
*Captain Corps of Engineers, U. S. A.*

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## APPENDIX *c*.

### WISCONSIN RIVER.

#### REPORT OF MR. JAMES D. RAYNOLDS, ASSISTANT ENGINEER.

ENGINEER OFFICE, UNITED STATES ARMY,
*Saint Paul, January* 5, 1880.

MAJOR: I have the honor submit the following report of examination of the sources of the Wisconsin and part of the Chippewa rivers, made under your direction from June 21, to October 18, 1879.

The region which I was instructed to examine, with a view to ascertaining its capabilities for storage reservoirs, included the Wisconsin River above Pelican, the Tomahawk above Squirrel, the Doré Flambeau above Fifield, and the North Fork of the Flambeau at, and above its junction with the Manitonish.

This I have divided for convenience into five principal watersheds, as shown on the general maps, and designated as follows:

I. *Pelican.*—Covering the Wisconsin watershed between Pelican River and Otter Rapids.

II. *Eagle.*—Including all the Wisconsin River above Otter Rapids.

III. *Tomakawk.*—Including all of Tomahawk River above section 7, township 39 north, range 6 east.

IV. *Bear Creek.*—Embracing the Manitonish as far as Rest Lake, and Bear Creek, with the lakes were it takes its rise.

V. *Round Lake.*—Including all the Doré Flambeau above Round Lake.

[Below Round Lake I was unable to find any available holding-ground, the stream being a continual succession of rapids. I made, also, some examination of Pelican River, since the high banks near its mouth seemed to promise considerable holding-ground. The stream was found, however, to have such rapid fall that even a 30-foot dam would flow but an insignificant area.]

I.—PELICAN WATERSHED. AREA, 361 SQUARE MILES.

Here were found two available dam-sites, one of which may be designated as "Pelican" proper, the other "Sugar Camp." Both have already been utilized by lumbermen.

At Pelican is a dam, built in 1878, of Norway pine, of the common cob-work pattern, concerning which I gathered the following data:

| | |
|---|---|
| Height above floor of sluice-way | 10.5 feet. |
| Length on crest | 425 feet. |
| Cost | $4,700 |

Probable duration variously estimated at three to eight years. From present appearances I should judge the lower limit to be nearest the truth, as Norway timber is soon destroyed by exposure to the weather and to alternate wetting and drying.

The present reservoir was never full but once—in May, 1879. Four weeks were required to fill it. When the gates are opened the escaping water reaches Wausau in from 50 to 52 hours. At this rate seven days would be required after opening the gates at Pelican for the water to reach the Mississippi at Prairie du Chien.

From a careful survey of the possible flowage area above Pelican dam the following results were obtained:

| | Cubic feet. |
|---|---|
| Capacity of reservoir with present dam (10.5 feet rise above "dead-head" or 13.5 feet rise above mean low-water | 880,000,000 |
| Capacity with 20 feet rise | 2,298,632,320 |
| Capacity with 28 feet rise | 5,153,180,527 |

To raise the water 28 feet would require a dam 800 feet long on crest, and a dike at head of "Lake No. 1," (as shown on detail map) having a length of 3,625 feet, and a maximum height of 15 feet.

The probable cost of this work, if executed at the present time, I place at $62,929.

The dam on Sugar Camp Creek was built some three years ago. It is 230 feet long and 5 feet high. Although of even cheaper construction than Pelican dam, it is in a very fair state of preservation. It has, however, not been in use since the first season, logging operations having been suspended since then.

By substituting a dam on this site 12.5 feet high and building in addition a low dike 260 feet long, a reservoir would be formed having an estimated capacity of 1,356,284,160 cubic feet. The cost of this work I place at $8,162.

Careful gaugings of the river just below Pelican dam, June 23 and 24, showed a discharge of 620 cubic feet per second. In the opinion of those most familiar with the river, it was at this time at about a mean stage. Assuming this to be true, a discharge of 620 cubic feet per second, for the entire year, would give 19,552,320,000 cubic feet.

The total drainage area above Pelican is 857 square miles, which, counting on .83 feet available rainfall, would give a yearly supply of 19,830,184,704 cubic feet. The drainage area of Pelican watershed alone (below Otter Rapids) is—

| | |
|---|---|
| Tributary to Pelican reservoir | 301 square miles. |
| Tributary to Sugar Camp reservoir | 60 square miles. |

Assuming as available one-third of an annual rainfall of 30 inches over the whole watershed, except the portions flowed, and, assuming further that, on account of evaporation, only one-sixth of that rainfall can be retained over the flooded area, we have—

| | Capacity. | Drainage area. | Net supply from rainfall. | Surplus. |
|---|---|---|---|---|
| | *Cubic feet.* | *Sq. miles.* | *Cubic feet.* | *Cubic feet.* |
| Pelican, 20 feet rise | 2,298,632,320 | 301 | 6,836,596,800 | 4,537,964,480 |
| Sugar Camp, 12.5 feet rise | 1,356,284,160 | 60 | 1,335,840,000 | ..... |
| OR, | | | | |
| Pelican, 28 feet rise | 5,153,180,527 | 301 | 6,836,596,800 | 1,683,416,273 |
| Sugar Camp, 12.5 feet rise | 1,356,284,160 | 60 | 1,335,840,000 | ..... |

From these two reservoirs could be delivered, for a period of 90 days, 834.5 cubic feet per second.

The total land area which would be flooded is—

| | State swamp lands. | Entered. | United States. | Total. |
|---|---|---|---|---|
| | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| Pelican | 2,222 | 833 | 3,999 | 7,054 |
| Sugar Camp | 1,448 | 326 | 433 | 2,207 |
| Total | 3,670 | 1,159 | 4,432 | 9,261 |

What good pine grew here has long ago been cut, and the land is, in my opinion, entirely worthless for agriculture, except some narrow strips of hay meadow and bottom-lands, now timbered with elm, white maple, &c., perhaps 2,000 acres altogether. None of it is at present under cultivation.

## II.—EAGLE WATERSHED. AREA, 496 SQUARE MILES.

Here were found three good dam-sites, all of which have been utilized by lumbermen. One at the head of Otter Rapids, one on Eagle River between Catfish and Cranberry Lakes, and one on Eagle River (here called "Fish-Trap Creek") above Cranberry Lake. The two latter dams were abandoned many years ago, and have fallen into complete decay. The dam at the head of Otter Rapids was built in the summer of 1878. It was nearly filled once (in December, 1878), raising the water about 5 feet above floor of sluice-way, or 7 foot above low water, when the east-wing "blew out," being poorly anchored in the treacherous, gravelly bank, and since then has been abandoned. From the survey of this location it was found that the water might safely be raised to a height of 22 feet. This would require, in addition to the dam, a low dike 700 feet long. By this means would be flooded the entire Eagle Lake system, giving a holding capacity of 7,389,727,488 cubic feet.

A cheaper plan than the above (though giving less holding capacity) would be to build the dam at Otter Rapids but 19 feet high, dispensing with the dike, and another dam on Fish-Trap Creek 8 feet high, thus forming two reservoirs, having a combined capacity of 5,851,676,160 cubic feet; or, instead of an 8-foot dam on Fish-Trap, one 17 feet high might be built between Catfish and Cranberry Lakes, which, in conjunction with the 19-foot dam at Otter Rapids, would give a capacity of 6,163,000,000 cubic feet.

The probable supply was arrived at by two methods.

1st. Careful gaugings of the Wisconsin, just above Otter Rapids, showed a discharge of 296 cubic feet per second, at a time when, from the best information obtainable, I estimated the discharge to be about 80 per cent. of the yearly mean. Assuming this to be true, the entire annual discharge would be 11,668,320,000 cubic feet.

2d. The area of Eagle watershed is 496 square miles, which, counting on .83 foot available rainfall, would give a yearly supply of 11,476,979,712 cubic feet.

The supply indicated by either of these methods is largely in excess of the maximum holding capacity of reservoir. Some additional capacity might be obtained by damming the outlets of Lake Vieux Desert and Twin Lakes. The amount stored would, however, be small, owing to the limited watershed tributary to these lakes, viz, 360,096,000 cubic feet for Vieux Desert and 621,456,000 cubic feet for Twin Lakes.

Vieux Desert I was unable to examine, but learned from those familiar with the country that a good dam-site exists near its outlet.

I made a tour of exploration to Twin Lakes, and estimated that, to store all the water obtainable, would require a dam 6 feet high and 1,500 feet long.

Assuming, as before, that over the whole watershed, except the portions flowed, one-third of an annual rainfall of 30 inches can be counted on; and that on account of evaporation only one-sixth of that rain-fall can be retained over the flowed area, we have—

| | Cubic feet. |
|---|---|
| $\frac{10}{12}$ foot × 12,594,345,984 = | 10,495,288,320 |
| $\frac{5}{12}$ foot × 1,233,340,416 = | 513,891,840 |
| Total net supply Eagle watershed | 11,009,180,160 |

Tabulating the above, we have as the best result obtainable for the Eagle watershed—

| | Capacity of reservoir. | Drainage area. | Net supply from rainfall. | Surplus. |
|---|---|---|---|---|
| | *Cubic feet.* | *Sq. miles.* | *Cubic feet.* | *Cubic feet.* |
| Otter, 22 feet rise | 7,389,727,488 | 447 | 10,027,628,160 | 2,637,900,672 |
| Vieux Desert | 400,000,000 | 19 | 360,096,000 | ..... |
| Twin Lakes | 650,000,000 | 30 | 621,056,000 | ..... |

From these three reservoirs could be delivered for a period of 90 days 1,076.54 cubic feet per second.

The probable cost, estimating at present prices, I place at $38,113 for dam and dike at Otter Rapids; $10,000 for dam at Twin Lakes, and $5,000 for dam at Lake Vieux Desert. Total, $53,113.

The area covered by these reservoirs is in greater part already covered by water, since the principal holding-ground consists of lakes with quickly-rising banks.

The total land area which would be flooded is—

| | State swamp lands. | Entered. | Military wagon-road grant. | Ownership not ascertained, approximate. | United States. | Total. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| Otter Rapids | 4,692 | 597 | 371 | ..... | 1,893 | 7,553 |
| Twin Lakes | ..... | ..... | ..... | 750 | ..... | 750 |
| Vieux Desert | ..... | ..... | ..... | 750 | ..... | 750 |
| Total | 4,692 | 597 | 371 | 1,500 | 1,893 | 9,053 |

It is of very small value, having been already stripped of its pine lumber, and offering not the smallest inducement to agricultural enterprise. Perhaps 500 acres consists of valuable hay meadows on the Wisconsin proper

### III.—TOMAHAWK WATERSHED.

This basin is comparatively small, comprising but 101.5 square miles. From this, by the same process as before, I deduce as the net annual supply 2,201,580,480 cubic feet, which can all be retained by a dam 12 feet high, for which an excellent site was found in section 7, township 39 north, range 6 east, where the high banks are less than 200 feet apart. Retaining all the water above this point reduces the area tributary to the Squirrel Creek reservoir (reconnoitered by Mr. Charles Wanzer in 1878) to 56 square miles, yielding an annual supply for storage of 1,239,427,200 cubic feet. To retain even this limited amount will probably require a dam 17 feet high, since further examination than was possible last winter has developed the fact that Squirrel Lake and adjacent swamps are above any attainable flowage plane, thus reducing the available holding-ground to less than half the area at which it was first estimated.

A gauging of the Tomahawk River, just above the selected dam-site, at a time when the water was apparently at a trifle below mean stage, showed a discharge of 64 cubic feet per second, which, if uniform for an entire year, would give as the available supply 2,018,304,000 cubic feet.

The land flooded by proposed reservoirs on the Tomahawk River would be as follows:

| | State swamp lands. | Entered. | Railroad. | Indian reservation. | United States. | Total. |
|---|---|---|---|---|---|---|
| | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| Upper Tomahawk | 548 | 215 | ..... | 120 | 1,087 | 1,970 |
| Squirrel | 2,370 | 105 | 80 | ..... | 495 | 3,050 |
| Rice Lake | 587 | 403 | ..... | ..... | 1,508 | 2,498 |
| Total | 3,505 | 723 | 80 | 120 | 3,090 | 7,518 |

There is a small Indian settlement between Lakes Kawaquesagon and Tomahawk, where a few acres are devoted to raising corn and potatoes. A narrow margin of these plantings would be flooded by the proposed dam, which would also drown out some quite extensive fields of wild rice, covering several hundred acres. With these exceptions I know of no injury that would be done to any private interests.

I place the probable cost of proposed works on the Tomahawk at the following figures:

| | |
|---|---|
| Upper Tomahawk dam | $4,729 00 |
| Squirrel dam and dike | 17,115 00 |
| Rice Lake dam | 24,930 00 |
| Total | 46,774 00 |

IV.—BEAR CKEEK WATERSHED, 154.5 SQUARE MILES.

This is an extensive but shallow basin, affording lager holding-ground, though in no place could high banks be found coming near enough together to render damming easy except just below Lake Flambeau, where a dam 265 feet long and but 4 feet high would hold all the water tributary to the lakes above. This amount is small, however; about 1,000,000,000 cubic feet.

The site offering the best results is immediately below the junction of the Manitonish with Bear Creek. Here good banks are found, though at a formidable distance apart—2,500 feet. A dam could be built here 15 feet high, which, in conjunction with 2,000 feet of dike, would back the water over the the lakes at head of Bear Creek and flood extensive meadows on Bear Creek and the Manitonish, forming a reservoir having an estimated capacity of 5,406,567,152 cubic feet. This reservoir would have, when full, a surface area of 1,156,953,600 square feet. Computing one-sixth of an annual rainfall of 30 inches over this area, and one-third of that rainfall over the rest of the watershed, we have, as the net annual supply, 3,107,280,000 cubic feet. The capacity of the reservoir is thus seen to be in excess of the supply by 2,299,287,152 cubic feet, which will go far towards retaining the surplus (3,057,100,264 cubic feet) coming over from Rest Lake reservoir above.

Rest Lake reservoir was surveyed by Mr. J. H. Dager, in 1878, and described in his report.

Tabulating results, we have for Bear Creek and Rest Lake watersheds:

| | Capacity of reservoir. | Drainage area. | Net supply from rainfall. | Surplus. |
|---|---|---|---|---|
| | *Cubic feet.* | *Sq. miles.* | *Cubic feet.* | *Cubic feet.* |
| Bear Creek | 5,406,567,152 | 154.5 | 3,107,280,000 | 757,813,112 |
| Rest Lake | 1,840,000,000 | 211.643 | 4,897,100,264 | |

Amount deliverable for a period of 90 days, per second, 931.91 cubic feet.

If constructed at the present time I estimate the cost of the above works as follows:

| | |
|---|---|
| For Bear Creek dam | $38,252 |
| For Bear Creek dike | 9,248 |
| For Rest Lake dam | 7,295 |
| For Rest Lake dike | 390 |
| Total | 55,185 |

The area to be flooded consists, aside from the lake systems, mainly of extensive meadows covered with excellent grass. There would also be drowned out some large fields of wild rice, from which the Indians on the Flambeau reservation derive, at present, a main item of subsistence. These Indians expressed great discontent at the possibility of any part of their domain being flooded, even showing a strong disposition to interfere with the progress of the survey.

V.—ROUND LAKE WATERSHED.

At the outlet of Round Lake a dam of fair construction already exists. It was built in 1876, and partially rebuilt since, at a total cost of $3,000, and is probably still good for five or six years' service. It is 170 feet long and raises the water 6 feet, with storage capacity for 884,860,000 cubic feet. The dam might safely be raised to a height of 10 feet, which, with a dike 250 feet long, would form a reservoir holding 1,303,036,416 cubic feet.

A good dam-site is found also below the outlet of Squaw Lake, in section 28, township 40 north, range 4 east. Here a dam 9 feet high would give a capacity of 731,808,000 cubic feet. Assuming the rainfall at 30 inches, and computing one-sixth of this on the area overflowed and one-third over the rest of the watershed, we have, tabulating the above:

| | Capacity of reservoir. | Drainage area. | Net supply from rainfall. | Surplus. |
|---|---|---|---|---|
| | *Cubic feet.* | *Sq. miles.* | *Cubic feet.* | *Cubic feet.* |
| Round Lake | 1,303,036,416 | 63 | 1,382,304,000 | 79,267,584 |
| Squaw Lake | 731,808,000 | 39 | 864,230,400 | 132,422,400 |
| Total | 2,034,844,416 | 102 | 2,246,534,400 | 211,689,984 |

This would give for a period of 90 days a discharge, per second, of 261.68 cubic feet.

With prices as at the present time, I estimate the cost of construction as follows:

| | |
|---|---|
| For Round Lake dam | $7,360 |
| For Round Lake dike | 3,190 |
| For Squaw Lake dam | 4,000 |
| Total | 14,550 |

Of the land area which would be flooded, a small part is well adapted for farming. The only portion at present under cultivation is a farm near the outlet of Pike Lake, of which a few acres would be submerged; the larger part is well above flowage. Some wild-rice fields would be drowned out; with these exceptions, the land to be overflowed is nearly valueless.

## METHODS OF SURVEY.

On the Pelican reservoir, transit and compass lines were run, meandering both lakes and swamps, and cross-sections taken at frequent intervals whereby the several contours up to 20 feet were accurately determined, and for the southern portion (where most of the holding-ground is) up to 28 feet. Progress was, however, necessarily slow, the swamps being thickly grown with tamarac and cedar, requiring a large force of axmen to cut out lines. Six weeks were consumed on this work, and it became evident that to make an equally detailed survey of the entire ground I was directed to examine would require more than double the time at my disposal. From this point, therefore, a system was adopted involving less accuracy of detail, but which, it is believed, has given results sufficiently close for present purposes and generally correct to within 10 or 15 per cent.

All the lakes encountered were found already meandered by the United States land surveys, and from these, and from cross-sections taken at sufficiently frequent intervals to determine the slope of their banks, their capacity as holding reservoirs was determined, the elevation of their natural surfaces being of course in all instances obtained by careful lines of levels from dam-site.

The swamps lying within reservoir limits were found almost without exception to have a tolerably uniform slope, determinable by random lines of levels projected into them where necessary. By this means, and by reference to the land maps, and verification of their indicated swamp areas by exploration, the different flowage lines were drawn in.

In the case of Pelican reservoir the results given are very accurate for a 20-foot dam, but less so for a 28-foot dam. For the latter my estimate of capacity is probably somewhat too low.

Throughout the survey a carefully-tested continuous line of levels was run, and finally connected with the bench at the mouth of Manitonish, to which levels had previously been run from the Wisconsin Central Railroad, giving its true height above the sea. My levels were then corrected back (in note-books) so as to refer all elevations to sea-level.

Bench-marks were established at prominent points over the entire work, clearly marked for future reference.

Concerning foundation for dams I can give little satisfactory information. No rock in place was anywhere encountered. Beneath a thin deposit of mud or surface-soil was found in all cases a drift formation, consisting of sand and gravel thickly interspersed with bowlders of all sizes up to 10 feet diameter, rendering it impossible to force a sounding-rod down to ascertain what lay beneath. From the frequency of side-hill swamps perhaps it may be inferred that an impervious stratum of clay exists at no great depth.

*Recapitulation of estimated cost of dams and dikes proposed on the Wisconsin River.*

| Designation of reservoir. | Cost of dam. | Cost of dike. | Total. |
|---|---|---|---|
| Pelican | $35,250 00 | $27,679 00 | $62,929 00 |
| Sugar Camp | 7,350 00 | 812 00 | 8,162 00 |
| Otter Rapids | 35,365 00 | 2,748 00 | 38,113 00 |
| Twin Lakes | 10,000 00 | | 10,000 00 |
| Vieux Desert | 5,000 00 | | 5,000 00 |
| Tomahawk | 4,729 00 | | 4,729 00 |
| Squirrel | 14,790 00 | 2,325 00 | 17,115 00 |
| Rice | 24,930 00 | | 24,930 00 |
| Total | 137,414 00 | 33,564 00 | 170,978 00 |

*Table showing the actual acreage, as nearly as it could be reckoned, of lands which would be overflowed by proposed dams on the Wisconsin River.*

| Designation of reservoir. | State swamp-lands. | Entered lands. | Military wagon-road grant. | Indian reservation. | Ownership not ascertained; approximate. | United States public lands. | Total. |
|---|---|---|---|---|---|---|---|
| | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| Pelican | 2,222 | 833 | | | | 3,999 | 7,054 |
| Sugar Camp | 1,448 | 326 | | | | 433 | 2,207 |
| Otter Rapids | 4,692 | 597 | 371 | | | 1,893 | 7,553 |
| Twin Lakes | | | | | 750 | | 750 |
| Vieux Desert | | | | | 750 | | 750 |
| Tomahawk | 548 | 215 | | 120 | | 1,087 | 1,970 |
| Squirrel | 2,370 | 185 | | | | 495 | 3,050 |
| Rice | 587 | 403 | | | | 1,508 | 2,498 |
| Total | 11,867 | 2,559 | 371 | 120 | 1,500 | 9,415 | 25,832 |

Very respectfully, your obedient servant,

JAMES D. RAYNOLDS,
*Assistant Engineer.*

Maj. CHARLES J. ALLEN,
*Captain, Corps of Engineers, U. S. A.*

## APPENDIX *d*.

### TABLE I.—SAINT CROIX RIVER.

*Table showing drainage area, supply by one-third rainfall, capacity of reservoirs, and quantity furnished per day and second for 90 days; also, surplus from watershed above Taylor's Falls not held by proposed dams. Rainfall, 25 inches.*

| River. | Reservoir. | Drainage area to each reservoir. | | Supply by one-third annual rainfall, 0.70. | Capacity of reservoir. | Surplus. |
|---|---|---|---|---|---|---|
| | | *Sq. miles.* | *Square feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* |
| | Mud Lake | 27½ | 766, 656, 000 | 536, 659, 200 | 396, 377, 420 | 140, 281, 780 |
| Yellow | Rice Lake | 134½ | 3, 749, 644, 800 | 2, 624, 751, 360 | 2, 474, 944, 500 | 149, 806, 860 |
| | Yellow Lake | 159½ | 4, 446, 604, 800 | 3, 112, 623, 360 | 3, 402, 712, 000 | |
| Namekagon | Veazies | 436 | 12, 154, 982, 400 | 8, 508, 487, 680 | 1, 379, 393, 850 | 7, 129, 093, 830 |
| | Mouth of Totogatic | 212 | 5, 910, 220, 800 | 4, 137, 154, 560 | 3, 082, 033, 820 | 1, 055, 120, 740 |
| | Upper Totogatic | 71. 15 | 1, 983, 722, 400 | 1, 388, 605, 680 | 1, 388, 605, 680 | |
| Totogatic | Gilmore Lake | 258. 85 | 7, 216, 149, 600 | 5, 051, 304, 720 | 2, 881, 095, 000 | 2, 170, 209, 720 |
| | Mouth of Totogatic | 59 | 1, 644, 825, 600 | 1, 151, 377, 920 | 1, 541, 016, 900 | |
| Saint Croix | Eau Claire Lakes | 71 | 1, 979, 366, 400 | 1, 385, 556, 480 | 961, 045, 400 | 424, 511, 080 |
| | Upper Saint Croix | 219 | 6, 105, 369, 600 | 4, 273, 758, 720 | 4, 698, 269, 800 | |
| Clam | Clam Lake | 283½ | 7, 903, 526, 400 | 5, 532, 468, 480 | 4, 670, 786, 500 | 861, 681, 980 |
| Snake | Ground House | 116 | 3, 233, 894, 400 | 2, 263, 726, 080 | 1, 045, 440, 000 | 1, 218, 286, 080 |
| | Chengwatana | 866 | 24, 142, 694, 400 | 16, 899, 886, 080 | 3, 703, 238, 000 | 13, 196, 643, 080 |
| Saint Croix | Lower Saint Croix | 1, 030 | 28, 714, 752, 000 | 20, 100, 326, 400 | 2, 709, 500, 000 | 17, 390, 826, 400 |
| Add watershed of Kettle River | | 1, 033 | 28, 798, 387, 200 | 20, 158, 871, 040 | | 20, 158, 871, 040 |
| Watershed of Snake River below dam, and Saint Croix, from mouth of Snake to dam | | 35 | 975, 744, 000 | 683, 020, 800 | | 683, 020, 800 |
| Saint Croix, above mouth of Snake—total | | 5, 012 | 139, 726, 540, 800 | 97, 808, 578, 560 | 34, 334, 458, 870 | 64, 578, 358, 390 |
| Saint Croix, from mouth of Snake to Taylor's Falls | | 1, 000 | 27, 878, 400, 000 | 19, 514, 880, 000 | | |
| Saint Croix River, above Taylor's Falls—total | | 6, 012 | 167, 604, 940, 800 | 117, 323, 458, 560 | | |

APPENDIX *d*—Continued.

| River. | Reservoir. | Excess of capacity over supply. | Surplus held by dams below. | Total surplus not held by dams. | From reservoirs, full, can be furnished for 90 days. | | Height of dam above low-water. | Cost of dams, not including damage to property. |
|---|---|---|---|---|---|---|---|---|
| | | | | | Per day. | Per second. | | |
| | | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *Feet.* | |
| | Mud Lake | | 140, 281, 780 | | 4, 404, 194 | 51 | 6 | $1, 200 00 |
| Yellow | Rice Lake | | 149, 806, 860 | | 27, 499, 382 | 318 | 25½ | 33, 266 70 |
| | Yellow Lake | 290, 088, 640 | | | 37, 807, 911 | 438 | 20 | 15, 403 92 |
| Namekagon | Veazies | | | | 15, 326, 598 | 177 | 31⅛ | 32, 762 75 |
| | Mouth of Totogatic | | | 8, 184, 214, 570 | 34, 244, 820 | 396 | 41 | 43, 610 45 |
| | Upper Totogatic | | | | 15, 428, 932 | 178 | 12½ | 7, 482 38 |
| Totogatic | Gilmore Lake | | 389, 638, 980 | | 32, 012, 166 | 370 | 30 | 21, 876 65 |
| | Mouth of Totogatic | 389, 638, 980 | | 1, 780, 570, 740 | 17, 122, 410 | 198 | | |
| Saint Croix | Eau Claire Lakes | | 424, 511, 080 | | 10, 678, 292 | 124 | 12½ | 9, 635 79 |
| | Upper Saint Croix | 424, 511, 080 | | | 52, 202, 998 | 604 | 24⅛ | 94, 319 55 |
| Clam | Clam Lake | | | 861, 681, 980 | 51, 897, 628 | 602 | 26 | 27, 217 33 |
| Snake | Ground House | | | | 11, 616, 000 | 134 | 20 | 8, 500 00 |
| | Chengwatana | | | 14, 414, 934, 160 | 41, 147, 088 | 476 | 13 | 30, 000 00 |
| Saint Croix | Lower Saint Croix | | | 17, 390, 826, 400 | 30, 105, 555 | 349 | 23½ | 60, 444 76 |
| Add watershed of Kettle River | | | | | | | | |
| Watershed of Snake River below dam, and Saint Croix, from mouth of Snake to dam | | | | 20, 841, 891, 840 | | | | |
| Saint Croix, above mouth of Snake—total | | 1, 104, 238, 700 | 1, 104, 238, 700 | 63, 474, 119, 690 | 381, 493, 985 | 4, 415 | | 385, 720 28 |
| Saint Croix, from mouth of Snake to Taylor's Falls | | | | 19, 514, 880, 000 | | | | |
| Saint Croix River, above Taylor's Falls—total | | | | 82, 988, 999, 690 | | | | |

## APPENDIX *e*.

### TABLE II.—SAINT CROIX RIVER.

*Table showing drainage area, supply by one-fourth rainfall, capacity of reservoirs and quantity furnished per day and second for ninety days; also, surplus from watershed above Taylor's Falls not held by proposed dams. Rainfall, 25 inches.*

| River. | Reservoir. | Drainage area to each reservoir. | | Supply by one-quarter annual rainfall, 0.52. | Capacity of reservoir. | Surplus. | Excess of capacity over supply. |
|---|---|---|---|---|---|---|---|
| | | *Sq. miles.* | *Square feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* |
| | Mud Lake | | | | | | |
| Yellow | Rice Lakes | 162 | 4, 516, 300, 800 | 2, 348, 476, 416 | 2, 474, 944, 500 | | 126, 468, 084 |
| | Yellow Lake | 159½ | 4, 446, 604, 800 | 2, 312, 234, 496 | 3, 402, 712, 000 | | 1, 090, 477, 504 |
| Namekagon | Veazies | 436 | 12, 154, 982, 400 | 6, 320, 590, 848 | 1, 379, 393, 850 | 4, 941, 196, 998 | |
| | Mouth of Totogatic | 212 | 5, 910, 220, 800 | 3, 073, 314, 816 | 3, 082, 033, 820 | | 8, 719, 004 |
| | Upper Totogatic | 71. 15 | 1, 983, 722, 400 | 1, 031, 535, 648 | 1, 388, 605, 680 | | 357, 070, 032 |
| Totogatic | Gilmore Lake | 258. 85 | 7, 216, 149, 600 | 3, 752, 397, 792 | 2, 881, 095, 000 | 871, 302, 792 | |
| | Mouth of Totogatic | 59 | 1, 644, 825, 600 | 855, 309, 312 | 1, 541, 016, 900 | | 685, 707, 588 |
| Saint Croix | Eau Claire Lakes | 290 | 8, 084, 736, 000 | 4, 204, 062, 720 | 4, 698, 269, 800 | | 494, 207, 080 |
| | Upper Saint Croix | | | | | | |
| Clam | Clam Lake | 283½ | 7, 903, 526, 400 | 4, 109, 833, 728 | 4, 670, 786, 500 | | 560, 952, 772 |
| Saint Croix | Lower Saint Croix | 1, 030 | 28, 714 752, 000 | 14, 931, 671, 040 | 2, 709, 500, 000 | 12, 222, 171, 040 | |
| Snake | Ground House | 116 | 3, 233, 894, 400 | 1, 681, 625, 088 | 1, 045, 440, 000 | 636, 185, 088 | |
| | Chengwatana | 866 | 24, 142, 694, 400 | 12, 554, 201, 088 | 3, 703, 238, 000 | 8, 850, 963, 088 | |
| Add watershed of Kettle River | | 1, 033 | 28, 798, 387, 200 | 14, 975, 161, 344 | | | |
| Watershed of Snake River, below dam, and Saint Croix, from mouth of Snake to dam | | 35 | 975, 744, 000 | 507, 386, 880 | | | |
| Saint Croix, above mouth of Snake—total | | 5, 012 | 139, 726, 540, 800 | 72, 657, 801, 216 | | | |
| Saint Croix, from mouth of Snake to Taylor's Falls | | 1, 000 | 27, 878, 400, 000 | 14, 496, 768, 000 | | | |
| Saint Croix River, above Taylor's Falls—total | | 6, 012 | 167, 604, 940, 800 | 87, 154, 569, 216 | | | |

APPENDIX *c*—Continued.

| River. | Reservoir. | Water which can be held by dams below. | Reduced capacity of reservoir. | Surplus not held by dams. | Total amount held by each reservoir. | From reservoirs, full, can be furnished for ninety days. | |
|---|---|---|---|---|---|---|---|
| | | | | | | Per day. | Per second. |
| | | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* |
| | Mud Lake | | | | | | |
| Yellow | Rice Lakes | 1, 090, 477, 504 | 1, 257, 998, 912 | | 1, 257, 998, 912 | 13, 977, 766 | 162 |
| | Yellow Lake | | | | 3, 402, 712, 000 | 37, 807, 911 | 438 |
| Namekagon | Veazies | 8, 719, 004 | | 4, 932, 477, 994 | 1, 379, 393, 850 | 15, 326, 598 | 177 |
| | Mouth of Totogatic | | | | 3, 082, 033, 820 | 34, 244, 820 | 396 |
| | Upper Totogatic | | 1, 031, 535, 648 | | 1, 031, 535, 648 | 11, 461, 507 | 132 |
| Totogatic | Gilmore Lake | 685, 707, 588 | | 185, 595, 204 | 2, 881, 095, 000 | 32, 012, 166 | 370 |
| | Mouth of Totogatic | | | | 1, 541, 016, 900 | 17, 122, 410 | 198 |
| Saint Croix | Eau Claire Lakes | | | | | | |
| | Upper Saint Croix | | 4, 204, 062, 720 | | 4, 204, 062, 720 | 46, 711, 808 | 541 |
| Clam | Clam Lake | | 4, 109, 833, 728 | | 4, 109, 833, 728 | 45, 664, 819 | 528 |
| Saint Croix | Lower Saint Croix | | | 12, 222, 171, 040 | 2, 709, 500, 000 | 30, 105, 555 | 349 |
| Snake | Ground House | | | 636, 185, 088 | 1, 045, 440, 000 | 11, 616, 000 | 134 |
| | Chengwatana | | | 8, 850, 963, 088 | 3, 703, 238, 000 | 41, 147, 088 | 476 |
| Add watershed of Kettle River | | | | 14, 975, 161, 344 | | | |
| Watershed of Snake River below dam, and Saint Croix, from mouth of Snake to dam | | | | 507, 386, 880 | | | |
| Saint Croix, above mouth of Snake—total | | | | 42, 309, 940, 638 | 30, 347, 860, 578 | 337, 198, 448 | 3, 901 |
| Saint Croix, from mouth of Snake to Taylor's Falls | | | | 14, 496, 768, 000 | | | |
| Saint Croix River, above Taylor's Falls—total | | | | 56, 806, 708, 638 | | | |

## APPENDIX *f*.

### TABLE III.—SAINT CROIX RIVER.

*Discharge in cubic feet per second of the Saint Croix River and tributaries.*

| Date. | Station. | Height above low-water. | Area of cross-section. | Slope. | Mean velocity. | Discharge in cubic feet per second. |
|---|---|---|---|---|---|---|
| 1879. | | | | | | |
| Oct. 14 | Saint Croix River, at head of Kettle River Rapids | 0.600 | 1,595.8 | 0.000356 | 1.351 | 2,158.7 |
| | do | 0.600 | 1,595.8 | 0.000356 | 1.313 | 2,095.7 |
| | do | 0.600 | 1,595.8 | 0.000356 | 1.322 | 2,114.1 |
| | do | 0.600 | 1,595.8 | 0.000356 | 1.220 | 1,951.2 |
| July 11 | Yellow River, at Rice Lake dam-site | 0.600 | 462.1 | 0.000056 | 0.457 | 211.1 |
| | do | 0.600 | 462.1 | 0.000056 | 0.424 | 196.2 |
| 14 | Namekagon River, at Veazies dam-site | 1.400 | 288.1 | 0.000152 | 1.349 | 388.8 |
| | do | 1.400 | 288.1 | 0.000152 | 1.377 | 396.9 |
| Aug. 29 | Namekagon, at lower dam-site | 0.800 | 494.0 | 0.000350 | 1.575 | 778.4 |
| | do | 0.800 | 494.0 | 0.000350 | 1.626 | 803.5 |
| 14 | Totogatic River, at upper dam-site | 0.300 | 130.2 | ..... | 0.246 | 32.1 |
| | do | 0.300 | 130.2 | ..... | 0.222 | 28.9 |
| | do | 0.300 | 130.2 | ..... | 0.202 | 26.3 |
| | do | 0.300 | 130.2 | ..... | 0.222 | 29.0 |
| 29 | Totogatic River, at the mouth | 1.000 | 199.7 | 0.00015 | 1.324 | 264.4 |
| | do | 1.000 | 199.7 | 0.00015 | 1.339 | 267.4 |
| | do | 1.000 | 199.7 | 0.00015 | 1.462 | 278.6 |
| | do | 1.000 | 199.7 | 0.00015 | 1.356 | 270.9 |
| | do | 1.000 | 199.7 | 0.00015 | 1.363 | 272.2 |
| 8 | Eau Claire, at dam-site | 0.500 | 73.0 | 0.00031 | 0.991 | 72.4 |
| Sept. 19 | Clam River, at dam-site | (*) | (*) | (*) | (*) | 103.6 |
| 26 | Snake River, at Brunswick | 0.300 | 160.7 | 0.000213 | 0.352 | 56.6 |
| | do | 0.300 | 160.7 | 0.000213 | 0.341 | 54.9 |
| Oct. 13 | Kettle River, one-half mile above mouth | 0.420 | 514.0 | 0.00058 | 1.103 | 564.7 |
| | do | 0.420 | 514.0 | 0.00058 | 1.107 | 569.0 |
| | do | 0.420 | 514.0 | 0.00058 | 1.033 | 531.1 |

* Low-water measured weir.

## APPENDIX *g*.

### TABLE IV.—SAINT CROIX RIVER.

*Elevations and slopes on Totogatic and Eau Claire Rivers.*

| Point of observation. | Approximate elevation above the sea. | True elevation above the sea. | Fall from last point. | Total fall. | Distance from last point. | Total distance. | Slope per mile from last point. | Slope per mile on total distance. |
|---|---|---|---|---|---|---|---|---|
| *Totogatic River.* | | | | | *Miles.* | *Miles.* | | |
| Limit of upper reservoir | ..... | 1,255 | ..... | ..... | ..... | ..... | ..... | ..... |
| Indian Crossing | ..... | 1,246 | 9 | 9 | 2 | 2 | 4.5 | 4.5 |
| Upper dam-site | ..... | 1,241 | 5 | 14 | 8 | 10 | 0.6 | 1.4 |
| Blackburn's Crossing | ..... | 1,168 | 73 | 87 | 4 | 14 | 18.2 | 6.2 |
| Mouth of Eagle-nest Creek | ..... | 1,003 | 165 | 252 | 17 | 31 | 9.7 | 8.1 |
| Mouth of Cranberry Creek | ..... | 984 | 19 | 271 | 8 | 39 | 2.4 | 6.9 |
| Gilmore Lake dam-site | ..... | 975 | 9 | 280 | 4 | 43 | 2.2 | 6.5 |
| Mouth of Chicorg Creek | ..... | 958 | 17 | 297 | 6 | 49 | 2.9 | 6.0 |
| Mouth of Totogatic River | ..... | 918 | 40 | 337 | 10 | 59 | 4.0 | 5.7 |
| *Eau Claire River.* | | | | | | | | |
| Second Eau Claire Lake | ..... | 1,122 | ..... | ..... | ..... | ..... | ..... | ..... |
| First Eau Claire Lake dam-site | ..... | 1,119 | 3 | 3 | 3 | 3 | 1.0 | 1.0 |
| Six miles below dam-site | ..... | 1,073 | 46 | 49 | 7 | 10 | 6.6 | 4.9 |
| At Antoine Gordon's | ..... | 1,012 | 61 | 110 | 7 | 17 | 8.7 | 6.5 |
| At mouth of Eau Claire | 1,008 | ..... | 4 | 114 | ½ | 17½ | 8.0 | 6.5 |

*Elevations and slopes on Yellow and Namekagon Rivers.*

| Point of observation. | Approximate elevation above the sea. | True elevation above the sea. | Fall from last point. | Total fall. | Distance from last point. | Total distance. | Slope per mile from last point. | Slope per mile on total distance. |
|---|---|---|---|---|---|---|---|---|
| *Yellow River.* | | | | | | | | |
| Mud Lake dam-site | | 1,085 | | | | | | |
| Rice Lake dam-site | | 969 | 116 | 116 | 20 | 20 | 5.8 | 5.8 |
| Yellow Lake dam-site | | 928 | 41 | 157 | 28 | 48 | 1.5 | 3.3 |
| Mouth of Yellow River | 888 | | 40 | 197 | 7 | 55 | 5.7 | 3.6 |
| *Namekagon River.* | | | | | | | | |
| Little Puckwawance | | 1,218 | | | | | | |
| Mouth of Chippenacia Creek | | 1,115 | 103 | 103 | 16 | 16 | 6.4 | 6.4 |
| Mouth of Spring Brook | | 1,068 | 47 | 150 | 6 | 22 | 7.9 | 6.8 |
| Mouth of Jordan River | | 1,058 | 10 | 160 | 1½ | 23½ | 6.6 | 6.8 |
| Veazie's dam-site | | 1,039 | 19 | 179 | 8 | 31½ | 2.4 | 5.6 |
| Mouth of Stuntz Brook | | 952 | 87 | 266 | 14½ | 46 | 6.0 | 5.8 |
| Mouth of McKenzie Brook | | 944 | 8 | 274 | 3 | 49 | 2.6 | 5.6 |
| Mouth of Totogatic River | | 918 | 26 | 300 | 10 | 59 | 2.6 | 5.1 |
| Lower dam-site | | 917 | 1 | 301 | 1 | 60 | 1.0 | 5.0 |
| Mouth of Namekagan River | 908 | | 9 | 310 | 4 | 64 | 2.2 | 4.8 |

*Elevations and slopes on Snake, Kettle, and Clam Rivers.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Snake River.* | | | | | | | | |
| Mouth of Knife River | | 964 | | | | | | |
| Mouth of Ann River | | 943 | 21 | 21 | 5 | 5 | 4.2 | 4.2 |
| Mouth of Ground House | | 940 | 3 | 24 | 4 | 9 | 0.75 | 2.7 |
| At Chengwatana | | 929 | 11 | 35 | 23 | 32 | 0.5 | 1.1 |
| Mouth of Snake River | 790 | | 139 | 174 | 12 | 44 | 11.6 | 4.0 |
| *Kettle River.* | | | | | | | | |
| Northern Pacific Railroad crossing | | 1,299 | | | | | | |
| Willow River, on St. Paul and Duluth Railroad | | 1,023 | 276 | 276 | 36 | 36 | 7.7 | 7.7 |
| Kettle River Station | | 1,016 | 7 | 283 | 5 | 41 | 1.4 | 6.9 |
| Mouth of Kettle River | 816 | | 200 | 483 | 33 | 74 | 6.6 | 6.5 |
| *Clam River.* | | | | | | | | |
| Limit of proposed reservoir | | 967 | | | | | | |
| At dam-site | | 947 | 20 | 20 | 10 | 10 | 2.0 | 2.0 |
| At Saint Croix Road crossing | | 881 | 66 | 86 | 13 | 23 | 5.0 | 3.7 |
| Mouth of Clam River | 866 | | 15 | 101 | 6 | 29 | 2.5 | 3.5 |

*Elevation of water-surface, at ordinary stage, of various points on the Saint Croix River, with slope per mile.*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Upper Saint Croix Lake | | 1,010 | | | | | | |
| Mouth of Moose River | | 1,001 | 9 | 9 | 21 | 21 | 0.4 | 0.4 |
| Mouth of Namekagon River | 908 | | 93 | 102 | 17 | 38 | 5.5 | 2.8 |
| Mouth of Yellow River | 888 | | 20 | 122 | 12 | 50 | 1.7 | 2.5 |
| Mouth of Clam River | 866 | | 22 | 144 | 12 | 62 | 1.8 | 2.3 |
| Head of Kettle River Rapids | 850 | | 16 | 160 | 9 | 71 | 1.8 | 2.2 |
| Mouth of Kettle River | 816 | | 34 | 194 | 2⅛ | 73⅛ | 13.6 | 2.6 |
| Foot of Kettle River Rapids | 801 | | 15 | 219 | 1½ | 75 | 10.0 | 3.0 |
| Mouth of Snake River | 790 | | 11 | 230 | 3 | 78 | 3.8 | 3.0 |
| Rush City Ferry | | 773 | 17 | 247 | 12 | 90 | 1.4 | 2.7 |
| Taylor's Falls | | 679 | 94 | 341 | 30 | 120 | 3.1 | 2.8 |
| Stillwater Falls | | 662 | 17 | 358 | 29 | 149 | 0.6 | 2.4 |

## APPENDIX *h*.

### TABLE V.—SAINT CROIX RIVER.

*Location and cost of dams for reservoirs on the Saint Croix River and tributaries.*

| Name and location of dam | Class of structure on which cost of dam was estimated. | Length of dam, not including dike. | Height of dam above low-water. | Cost of dam, not including cost of dike. | Length of dike, earth embankment. | Height of dike. | Cost of dike. | Cost of dams, including cost of dikes. |
|---|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Feet.* | | *Feet.* | *Feet.* | | |
| Mud Lake, section 27, township 37 north, range 12 west | Earth and cob work | 120 | 6 | $1,200 00 | | | | $1,200 00 |
| Rice Lake, section 16, township 39 north, range 14 west | Crib-work filled with stone or gravel. | 500 | 25½ | 29,066 70 | 1,500 | 13 | $4,200 00 | 33,266 70 |
| Yellow Lake, section 24, township 40 north, range 17 west | Timber and earth | 230 | 20 | 15,403 92 | | | | 15,403 92 |
| Veazie's, section 36, township 40 north, range 12 west | Crib-work filled with stone or gravel. | 380 | 31½ | 29,605 25 | 700 | 6 | 3,157 50 | 32,762 75 |
| Mouth of Totogatic, section 33, township 42 north, range 14 west | do | 600 | 41 | 43,610 45 | | | | 43,610 45 |
| Upper Totogatic, section 12, township 42 north, range 10 west | Timber and earth | 360 | 12½ | 7,482 38 | | | | 7,482 38 |
| Gilmore Lake, section 13, township 42 north, range 13 west | Crib-work with gravel filling, timber piers, and embankment. | 380 | 30 | 21,876 65 | | | | 21,876 65 |
| Eau Claire Lake, section 25, township 44 north, range 10 west | Timber and earth | 220 | 12½ | 9,635 79 | | | | 9,635 79 |
| Saint Croix Lake, section 35, township 44 north, range 13 west | Earth and stone | 3,000 | 24½ | 94,319 55 | | | | 94,319 55 |
| Clam Lake, section 26, township 39 north, range 16 west | Timber and earth | 550 | 26 | 27,217 33 | | | | 27,217 33 |
| Head of Kettle River Rapids, section 2, township 39 north, range 19 west. | Timber, earth, and stone | 2,450 | 23½ | 60,444 76 | | | | 60,444 76 |
| Ground House, section 7, township 38 north, range 24 west | Earth and stone | 700 | 20 | 8,500 00 | | | | 8,500 00 |
| Chengwatana, section 26, township 39 north, range 21 west | do | 600 | 13 | 30,000 00 | | | | 30,000 00 |
| Total | | 10,190 | | 378,362 78 | 2,200 | | 7,357 50 | 385,720 28 |

## APPENDIX *i*.

### TABLE VI.—SAINT CROIX RIVER

*List of existing sluicing-dams owned by private parties or corporations in operation on the Saint Croix watershed.*

| Location of dam. | To whom charter is granted. | When built. | Head. | Width of gate-way. | Holding capacity. | Number of days driving. | Cost. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | *Feet.* | *Feet.* | *Cubic feet.* | | | |
| Namekagon Lake | Namekagon and Totogatic Dam Company. | 1869 | 9 | 30 | 1, 500, 000, 000 | 20 | ..... | Generally fills to 6-foot head in eleven months. Filled to 9-foot head once in nine years. |
| Totogatic dam, section 12, township 42, range 10 | ....do | 1860 | 9 | 30 | 1, 250, 000, 000 | ..... | $1, 180 | Kept in good repair; might be utilized for holding its capacity. Is the only one of consequence on this stream. |
| Saint Croix dam, section 7, township 44, range 11 | ....do | 1871 | 10 | 100 | ..... | 2½ | ..... | Gives two to three days' driving, with gate-discharge of 450 square feet. This discharge raises the water 1 foot on Kettle River Rapids, 50 miles below. |
| Clam Lake | ....do | 1877 | 8 | 36 | 700, 000, 000 | ..... | 1, 230 | Dam in good condition. The head cannot be raised, except at great expense. |
| Mud Lake dam, on Yellow River | ....do | ..... | 7½ | 30 | 475, 000, 000 | 7 to 10 | 800 | Can be utilized for holding its capacity with slight repairs. |
| Hector dam, section 10, township 38, range 13 | ....do | ..... | 7½ | 30 | ..... | 2 | 800 | Very small holding grounds. |
| Rice Lake dam | ....do | 1878 | 10 | 30 | 700, 000, 000 | ..... | 2, 200 | Rebuilt in 1878. The head might be raised to 15 feet. |
| Yellow Lake | ....do | 1869 | 10 | 57 | 1, 400, 000, 000 | ..... | 1, 800 | In poor condition; needs rebuilding. |
| First Eau Claire Lake | ....do | 1867 | 8 | 48 | 500, 000, 000 | ..... | 1, 500 | Worthless. |
| Third Eau Claire Lake | Walker, Judd & Veazie .. | 1872 | 8 | 48 | 500, 000, 000 | ..... | ..... | In good condition. |
| Hanscom, section 2, township 40, range 10 | ..... | ..... | ..... | ..... | ..... | 1 | ..... | Very small holding grounds. |
| Puckwawance, section 1, township 41, range 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Holding grounds small. |
| | *To whom licensed.* | | | | | | | |
| Knife River, section 15, township 40, range 24 | Danforth Bros. & Bean.... | ..... | 8 | 40 | ..... | 6 | 1, 500 | 162 square feet gate-discharge; raises Snake River 1.2 feet. |
| Ann River, section 30, township 40, range 24 | ....do | ..... | 6 | 40 | ..... | 6 | 1, 000 | Holding grounds small. |
| Ann River, section 24, township 39, range 24 | ....do | ..... | 8 | 24 | ..... | 6 | 1, 000 | Do. |
| Ground House, section 7, township 38, range 24 | ..... | ..... | 11 | 26 | 300, 000, 000 | 6 | 2, 000 | Raises Snake River 6 inches. |
| Chengwatana | Anna Munch | 1877 | 9⅓ | 116 | 1, 689, 819, 200 | ..... | 6, 300 | |
| Upper Snake River, section 32, township 42, range 23 | ..... | ..... | 10 | 32 | ..... | 1 | ..... | Very small holding ground. |
| Mud Creek, section 1, township 39, range 23 | ..... | ..... | 6 | 16 | 1, 500, 000, 00, | ..... | 500 | |

## APPENDIX *j*.

### TABLE VII.—SAINT CROIX RIVER.

*Miles of telegraph-line required to connect the Saint Croix system of reservoirs.*

| | Miles. |
|---|---|
| Pine City, on Saint Paul and Duluth Railroad, to dam on Ground House | 24 |
| Pine City, on Saint Paul and Duluth Railroad, to dam at Chengwatana | 2 |
| Chengwatana to dam on Saint Croix, at head of Kettle River Rapids | 14 |
| Head of Kettle River Rapids to dam on Yellow Lake | 14 |
| Yellow Lake to dam on Namekagon, below the mouth of Totogatic River | 18 |
| Mouth of Totogatic to dam on Saint Croix, below Lake Saint Croix | 14 |
| Branch (offset) to dam on Totogatic, below Gilmore Lake | 5 |
| Lake Saint Croix to dam at outlet of Eau Claire Lake | 19 |
| Eau Claire Lake to dam on upper Totogatic | 9 |
| Mouth of Totogatic to dam on Namekagon, at Veazie's | 21 |
| Yellow Lake to dam on Clam River, below Clam Lake | 10 |
| Clam Lake to dam on Yellow River, below Rice Lakes | 10 |
| Total | 160 |

Making Pine City, on the Saint Paul and Duluth Railroad, the headquarters office of the system, this point being 64 miles distant from Saint Paul.

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## APPENDIX *k*.

### TABLE VIII.—SAINT CROIX RIVER.

*List of lands and approximate areas which will be overflowed by proposed reservoirs on Saint Croix River and tributaries.*

RICE LAKE DAM.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 39, *range* 14 *west of the* 4*th M.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 3 | Lot 1 | 64 | | | | |
| 3 | E. ½ SE. ¼, lots 2, 3, 4, 5, 6, 7 | | | | 322 | |
| 4 | SW. ¼ SE. ¼, lots 3, 4 | | | | | 118 |
| 9 | Lots 1, 2, 3 | | | | 97 | |
| 10 | Lots 5, 6 | | | 83 | | |
| 10 | Lots 1, 2, 3, 4, 7 | | | | | 251 |
| 11 | Lots 1, 2, SW. ¼ SE. ¼ NW. ¼ | | | | 305 | |
| 11 | SW. ¼ NE. ¼ | | | | 40 | |
| 12 | Lots 1, 2, 3, 4 | | | | | 145 |
| 13 | N. ½ SE. ¼, SE. ¼ NE. ¼, lots 1, 2, 3, 4, 5 | | | | 386 | |
| 14 | Lots 1, 2, 3, SW. ¼ SW. ¼ | | | | | 161 |
| 15 | Lots 2, 3, 4, NW. ¼ SW. ¼ | 139 | | | | |
| 15 | Lots 1, 5, 6, S. ½ SW. ¼ | | | | 199 | |
| 15 | SW. ¼ NW. ¼ | 40 | | | | |
| 16 | E. ½ NE. ¼, N. ½ SE. ¼, SW. ¼ NE. ¼ | | 200 | | | |
| 16 | SW. ¼ SE. ¼ NW. ¼ | | 200 | | | |
| 22 | E. ½ SE. ¼, lots 1, 2, 3 | 180 | | | | |
| 22 | E. ½ NW. ¼, NW. ¼ SE. ¼, lot 4 | | | | | 154 |
| 23 | W. ½ NW. ¼, W. ½ SW. ¼ | 160 | | | | |
| 23 | E. ½ NW. ¼, E. ½ SW. ¼, E. ½ SE. ¼, NW. ¼ SE. ¼ | | | | 280 | |
| 24 | NW. ¼ SW. ¼ | | | 40 | | |
| 24 | S. ½ SW. ¼ | | | | | 80 |
| 25 | NE. ¼ NW. ¼, W. ½ NE. ¼ | | | | 120 | |
| 26 | NW. ¼ NW. ¼ | 40 | | | | |
| 26 | SW. ¼ NW. ¼ | | | | | 40 |
| 27 | E. ½ NE. ¼ | | | | 80 | |
| | Total | 623 | 400 | 123 | 1,829 | 949 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

RICE LAKE DAM—Continued.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 40, *range* 17 *west of the 4th M.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 13 | Lots 1, 2, 3, 4 | | | | | 165 |
| 14 | Lots 2, 3, 4 | | | | | 163 |
| 24 | S. ½ SW. ¼, NE. ¼ SW. ¼ | | | 120 | | |
| 24 | Lot. 3, 4, 5, 6 | | | | | 157 |
| 23 | Lots 3, 5 | | | 85 | | |
| 23 | NW. ¼, W. ½ NE. ¼, lots 1, 2 | | | | | 328 |
| 23 | W. ½ SW. ¼, lot 4 | | | | | 132 |
| 26 | Lots 1, 2, 3, 4, SW. ¼, S. ½ SE. ¼ | | | | | 426 |
| 25 | Lots 1, 3, 6 | | | 113 | | |
| 25 | Lot 4 | | | | | 12 |
| 36 | Lots 1, 2, 3, 4, 5, W. ½ SW. ¼, SE. ¼ SW. ¼ | | | | | 317 |
| | *Township* 40, *range* 16 *west of the 4th M.* | | | | | |
| 19 | Lots 4, 5, S. ½ 6 | | | 92 | | |
| 19 | NW. ¼ SE. ¼, lot 3 | | | | | 96 |
| 20 | N. ½ NE. ¼, SW. ¼ NE. ¼, N. ½ SE. ¼ | | | | | 200 |
| 20 | SE. ¼ SE. ¼ | 40 | | | | |
| 20 | SE. ¼ NE. ¼ | | | 40 | | |
| 20 | SW. ¼ SE. ¼, NE. ¼ SW. ¼, lots 1, 2 | | | | | 163 |
| 21 | SW. ¼ NW. ¼, SW. ¼, lots 1, 2 | | | | | 285 |
| 29 | NE. ¼ NE. ¼, lots 4, 5 | 97 | | | | |
| 29 | SE. ¼ NE. ¼, E. ½ SE. ¼, lots 1, 2, 3 | | | | | 236 |
| 30 | Lot 2 | 12 | | | | |
| 30 | Lot 1 | | | 8 | | |
| 31 | Lots 1, 2, 3, 4 | 158 | | | | |
| 32 | NW. ¼, W. ½ SW. ¼ | 240 | | | | |
| 32 | E. ½, E. ½ SW. ¼ | | | | | 400 |
| 33 | SW. ¼ SW. ¼ | | | | | 40 |
| | *Township* 39, *range* 16 *west of the 4th M.* | | | | | |
| 2 | NW. ¼ SW. ¼ | 40 | | | | |
| 2 | E. ½ SW. ¼ | | | 80 | | |
| 2 | SW. ¼ SW. ¼ | | | | | 40 |
| 3 | E. ½ SE. ¼ | 80 | | | | |
| 3 | W. ½ SE. ¼, N. ½ SW. ¼, SE. ¼ NW. ¼, lot 3 | | | | | 239 |
| 4 | Lot 2, SW. ¼ NE. ¼, N. ½ SE. ¼ | | | | | 163 |
| 4 | N. ½ SW. ¼ NW. ¼ | | | | | 124 |
| 5 | NE. ¼ NE. ¼, W. ½ NW. ¼ | 102 | | | | |
| 5 | SW. ¼ SE. ¼ | | | 40 | | |
| 5 | NW. ¼ NE. ¼, S. ½ NE. ¼, E. ½ NW. ¼ | | | | | 200 |
| 5 | SW. ¼, N. ½ SE. ¼, SE. ¼ SE. ¼ | | | | | 280 |
| 6 | E. ½ NE. ¼ | 72 | | | | |
| 6 | W. ½ NE. ¼ NW. ¼, NE. ¼ SE. ¼ | | | | | 253 |
| | *Township* 39, *range* 17 *west of the 4th M.* | | | | | |
| 1 | NE. ¼ | | | | | 154 |
| | Total | 841 | | 578 | | 4,673 |

CLAM LAKE DAM.

| | | | | | | |
|---|---|---|---|---|---|---|
| | *Township* 39, *range* 16 *west of the 4th M.* | | | | | |
| 26 | NW. ¼ SE. ¼ | | | 40 | | |
| 26 | Lots 1, 2, 3, NE. ¼ SW. ¼ | | | | | 133 |
| 26 | SE. ¼ SE. ¼ | | | | | 40 |
| 27 | Lot 1, SW. ¼ SE. ¼ | | | | | 76 |
| 34 | Lots 1, 4, 5 | | | 79 | | |
| 34 | Lots 2, 3 | | | | | 71 |
| 35 | Lots 2, 3, 4, 5, 6, E. ½ SE. ¼, NW. ¼ SE. ¼ | | | | 330 | |
| 36 | NW. ¼ NW. ¼, NW. ¼ SW. ¼ | | | | 80 | |
| 36 | SW. ¼ NW. ¼, SW. ¼ SW. ¼ | | | | | 80 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

CLAM LAKE DAM—Continued.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 38, *range* 16 *west of the 4th M.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 1 | Lots 3, 4, 5, 6 | | | | 151 | |
| 2 | Lot 4 | | | 33 | | |
| 2 | Lots 1, 3, 7, 10, 11, 12 | | | | | 180 |
| 3 | Lots 2, 5, 6, 9, 10, SW. ¼ SE. ¼ SW. ¼ | | | | 442 | |
| 9 | Lots 1, 2, 3, SW. ¼ SE. ¼ | | | | 146 | |
| 10 | Lots 2, 3 | 95 | | | | |
| 10 | Lots 1, 4, 5 | | | | | 97 |
| 11 | Lot 5 | 7 | | | | |
| 11 | Lots 1, 2, 3, 4, E. ½ NE. ¼ | | | 27 | 248 | |
| 12 | W. ½ NW. ¼, W. ½ SW. ¼ | | | | 160 | |
| 13 | W. ½ NE. ¼, S. ½ SE. ¼, NW. ¼ SE. ¼, W. ½ | | | | 520 | |
| 14 | Lots 1, 4, SE. ¼ SW. ¼ | | 85 | | | |
| 14 | Lot 2, NE. ¼ SE. ¼ | | | 88 | | |
| 14 | Lots 3, 5, 6, S. ½ SE. ¼, W. ½ SW. ¼ | | | | | 268 |
| 15 | Lots 1, 2, 3, 4, SE. ¼, N. ½ SW. ¼ | | | | 467 | |
| 15 | Lot 6 | | | 38 | | |
| 16 | NE. ¼ NW. ¼, NW. ¼, lots 1, 2, 3, 4, 5 | 439 | | | | |
| 17 | Lots 1, 2, SE. ¼ NE. ¼ | | | | | 137 |
| 20 | SE. ¼ NE. ¼ | | | 40 | | |
| 20 | W. ½ NE. ¼, W. ½ SE. ¼, lots 4, 5, 6 | | | | | 264 |
| 21 | Lot 2 | 23 | | | | |
| 21 | Lots 1, 4, 5, 6, 7 | | | | 205 | |
| 22 | NE. ¼ NE. ¼ | 40 | | | | |
| 22 | Lot 1, NW. ¼ NE. ¼ | | | | | 63 |
| 23 | N. ½, N. ½ SW. ¼ | | | | 400 | |
| 24 | SE. ¼, SE. ¼ NW. ¼, SW. ¼ NE. ¼ | | | 240 | | |
| 24 | E. ½ NE. ¼, NW. ¼ NE. ¼, N. ½ NW. ¼ | | | | | 200 |
| 24 | SW. ¼, NW. ¼ SW. ¼ | | | | | 200 |
| 25 | N. ½, NE. ¼ SE. ¼ | | | | 60 | |
| 26 | SE. ¼ NE. ¼ | | | 40 | | |
| 26 | NW. ¼, N. ½ NE. ¼, SW. ¼ NE. ¼ | | | | | 280 |
| 27 | NE. ¼ NE. ¼, N. ½ NW. ¼, SW. ¼ NW. ¼, NW. ¼ SW. ¼ | 240 | | | | |
| 27 | S. ½ NE. ¼, SE. ¼ NW. ¼, SW. ¼ SW. ¼ | | | | 160 | |
| 28 | Lot 3 | 36 | | | | |
| 28 | Lots 1, 2, NW. ¼ NW. ¼, NE. ¼ SE. ¼ | | | | | 170 |
| | *Township* 38, *range* 15 *west of the 4th M.* | | | | | |
| 17 | SW. ¼, N. ½ SE. ¼ | | | | 240 | |
| 18 | SE. ¼ | | | | | 160 |
| 19 | Lots 1, 2, 3, 4, 5, 6, 7, 8, SE. ¼ SE. ¼ | 366 | | | | |
| 19 | Lots 9, 10, 11, 12, NE. ¼, N. ½ SE. ¼, SW. ¼ SE. ¼ | | | | 444 | |
| 30 | Lots 3, 4 | | | 84 | | |
| 30 | Lots 1, 2, N. ½ NE. ¼ | | | | | 160 |
| | Total | 1,246 | 85 | 709 | 4,353 | 2,579 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

LOWER SAINT CROIX DAM, HEAD OF KETTLE RIVER RAPIDS.

| Section. | Description. | Transferred to the States of Wisconsin and Minnesota. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 40, *range* 18, *west of the 4th M.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 14 | Lots 1, 2, 3, 4, 5, Wisconsin | 196 | | | | |
| 14 | Lots 2, 3, 4, 5, 6, Minnesota | | | 165 | | |
| 15 | Lot 1, Wisconsin | 29 | | | | |
| 15 | Lots 1, 2, 3, 4, Minnesota | | | 140 | | |
| 19 | Lot 1, Minnesota | 9 | | | | |
| 19 | W. ½ NE. ¼, E. ½ NW. ¼, E. ½ SW. ¼, lots 2, 3, Minnesota | | | 335 | | |
| 19 | Lot 1, Wisconsin | 30 | | | | |
| 19 | W. ½ SW. ¼, Minnesota | | | | 80 | |
| 20 | Lot 4, Minnesota; lots 1, 2, Wisconsin | 84 | | | | |
| 20 | Lots 1, 2, 3, Minnesota; lot 3, Wisconsin | | | 152 | | |
| 21 | Lots 1, 2, 3, 4, Wisconsin; 1, 2, Minnesota; SE. ¼ SW. ¼, Wisconsin | 277 | | | | |
| 21 | Lots 3, 4, 5, Minnesota; E. ½ SE. ¼, SW. ¼ SE. ¼, Wisconsin | | | 257 | | |
| 22 | Lots 1, 2, Wisconsin; 1, 2, Minnesota; S. ½ | 428 | | | | |
| 22 | NE. ¼, SE. ¼ NW. ¼, Wisconsin | 200 | | | | |
| 23 | NW. ¼, W. ½ NE. ¼, NE. ¼ NE. ¼, Wisconsin | 280 | | | | |
| 23 | SE. ¼ NE. ¼, Wisconsin | | | | | 40 |
| 23 | SW. ¼, Wisconsin | 160 | | | | |
| 27 | NW. ¼, W. ½ NE. ¼, NE. ¼ NE. ¼, Wisconsin | 280 | | | | |
| 27 | SE. ¼ NE. ¼, Wisconsin | | | | | 40 |
| 28 | N. ½ SE. ¼, N. ½ SW. ¼, W. ½ NE. ¼, Wisconsin | 240 | | | | |
| 28 | NE. ¼ NE. ¼, NE. ¼ NW. ¼, Wisconsin | | | 80 | | |
| 28 | W. ½ NW. ¼, SE. ¼ NE. ¼, SE. ¼ NW. ¼, Wisconsin | 160 | | | | |
| 29 | W. ½ NW. ¼, SE. ¼, NW. ¼ NE. ¼, Wisconsin | 280 | | | | |
| 29 | NE. ¼ NW. ¼, Wisconsin | | | 40 | | |
| 29 | N. ½ SE. ¼, N. ½ SW. ¼, Wisconsin | 160 | | | | |
| 30 | Lots 1, 2, 3, 4, Wisconsin; NE. ¼ SE. ¼, Wisconsin | 227 | | | | |
| 30 | Lots 1, 2, 3, Minnesota | | | 143 | | |
| 30 | Lot 5, Wisconsin | | | | | 59 |
| | *Township* 40, *range* 19 *west of the 4th M.* | | | | | |
| 22 | SE. ¼ SW. ¼, SE. ¼, Minnesota | 200 | | | | |
| 23 | S. ½, SE. ¼ NE. ¼, Minnesota | 360 | | | | |
| 23 | NE. ¼ NE. ¼, SW. ¼ NE. ¼, Minnesota | | | 80 | | |
| 24 | S. ½ NW. ¼, SW. ¼, W. ½ SE. ¼, SE. ¼ SE. ¼, Minnesota | 360 | | | | |
| 24 | N. ½ NW. ¼, NE. ¼ SE. ¼, SW. ¼ NE. ¼, Minnesota | | | 160 | | |
| 25 | Lots 1, 2, 3, Wisconsin; NW. ¼, Minnesota | 268 | | | | |
| 25 | Lots 1, 2, 3, 4, 5, Minnesota | | | 216 | | |
| 25 | SE. ¼ SE. ¼, Wisconsin | | | | | 40 |
| 26 | Whole, Minnesota | 640 | | | | |
| 27 | N. ½, E. ½ SE. ¼, NW. ¼ SE. ¼, NW. ¼ SW. ¼, Minnesota | 480 | | | | |
| 27 | SW. ¼ SE. ¼, SE. ¼ SW. ¼, NE. ¼ SW. ¼, SW. ¼ SW. ¼, Minnesota | | | 80 | 80 | |
| 28 | SE ¼ NE. ¼, E. ½ SE. ¼, Minnesota | 120 | | | | |
| 34 | Lot 1, NE. ¼ SE. ¼, Minnesota | | | 78 | | |
| 35 | Lot 4, Wisconsin | 33 | | | | |
| 35 | Lots 2, 3, Wisconsin; 3, 4, 5, Minnesota; NW. ¼ SW. ¼, Minnesota | | | 253 | | |
| 35 | Lot 1, Wisconsin | 32 | | | | |
| 35 | SE. ¼ NW. ¼, Minnesota; lots 1, 2, Minnesota | | | 133 | | |
| 36 | W. ½ NW. ¼, NE. ¼ NW. ¼, Wisconsin | 112 | | | | |
| 36 | SE. ¼ NW. ¼, Wisconsin | | | 40 | | |
| 36 | NW. ¼ NE. ¼, Wisconsin | | | | | 40 |
| | Total | 5,645 | | 2,415 | 160 | 259 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

NAMEKAGON AT VIEZIE'S.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 39, *range* 9 *west of the* 4th *M.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 2 | Lots 1, 2 | | | 63 | | |
| 2 | SE. ¼ NW. ¼ | | | | | 40 |
| | *Township* 39, *range* 11 *west of the* 4th *M.* | | | | | |
| 6 | NW. ¼, W. ½ SW ¼ | | | | | 327 |
| 7 | Lots 1, 2 | | | | 78 | |
| | *Township* 39, *range* 12 *west of the* 4th *M.* | | | | | |
| 1 | SE. ¼ NE. ¼, NE. ¼ SE. ¼, SE. ¼ SE. ¼, NE. ¼ NE. ¼ | | | | 160 | |
| 12 | Lot 1, NE. ¼ NE. ¼ | | | | | 79 |
| | *Township* 40, *range* 12 *west of the* 4th *M.* | | | | | |
| 11 | SE. ¼ SE. ¼ | | | | 40 | |
| 12 | SW. ¼ SW. ¼ | | | | | 40 |
| 13 | W. ½ NW ¼ | | | | 80 | |
| 14 | E. ½ NE. ¼, SE. ¼ | | | | | 240 |
| 23 | Lots 1, 2, 3, 4, 5 | | | | 195 | |
| 24 | Lots 1, 2, 3 | | | | | 105 |
| 25 | NW. ¼, E. ½ SW. ¼, S. ½ SE. ¼, NW. ¼ SE. ¼ | | | | 360 | |
| 36 | E. ½ NE. ¼ | 80 | | | | |
| 36 | E. ½ SE. ¼ | | | 80 | | |
| 36 | W. ½ NE. ¼, W. ½ SE. ¼ | | | | | 160 |
| | *Township* 40, *range* 11 *west of the* 4th *M.* | | | | | |
| 30 | W. ½ NE. ¼, NE. ¼ NE. ¼, S. ½ SE. ¼, E. ½ SW. ¼ | | | | | 280 |
| 30 | NW. ¼ SE. ¼ | | | | | 40 |
| 31 | NW. ¼, N. ½ NE. ¼, SW. ¼ NE. ¼, SW. ¼ | | | | 440 | |
| 15 | SE. ¼ | | | | 160 | |
| 9 | SW. ¼ SW. ¼ | 40 | | | | |
| 9 | E. ½ SW. ¼, NW. ¼ SW. ¼ | | | | 120 | |
| 16 | SW. ¼ NE. ¼, NW. ¼, E. ½ SW. ¼, SE. ¼ | | | | | 480 |
| 17 | S. ½ SW. ¼ | | | | 80 | |
| 19 | E. ½ NE. ¼ | | | | 80 | |
| 20 | W. ½, W. ½ NE. ¼, SE. ¼ | | | | | 560 |
| 21 | SE. ¼ SW. ¼, E. ½ | | | | 360 | |
| 22 | NW. ¼, N. ½ SW. ¼ | | | | | 240 |
| 28 | NW. ¼ SW. ¼ | | | 40 | | |
| 28 | NW. ¼, W. ½ NE. ¼, SE. ¼, NE. ¼ SW. ¼ | | | | | 440 |
| 29 | E. ½ NE. ¼, W. ½, W. ½ SE. ¼ | | | | 480 | |
| | Total | 120 | | 183 | 2,633 | 3,031 |

UPPER SAINT CROIX DAM.

| | | | | | | |
|---|---|---|---|---|---|---|
| | *Township* 44, *range* 13 *west of the* 4th *M.* | | | | | |
| 26 | SE. ¼ | 160 | | | | |
| 35 | NE. ¼ | | | | 160 | |
| 25 | S. ½ SW. ¼ NE. ¼, SE. ¼ NW. ¼ | 400 | | | | |
| 36 | N. ½ NE. ¼, N. ½ NW. ¼ | 160 | | | | |
| 36 | N. ½ SE. ¼ NE. ¼ | | | 20 | | |
| 36 | S. ½ NW. ¼, SW. ¼ NE. ¼, S. ½ SE. ¼ NE. ¼ | | | | | 140 |
| | *Township* 44, *range* 12. | | | | | |
| 25 | S. ½, NE. ¼ NE. ¼, S. ½ NE. ¼, SE. ¼ NW. ¼ | 480 | | | | |
| 25 | SW. ¼ NW. ¼ | | | | 40 | |
| 26 | SE. ¼ SW. ¼ | 40 | | | | |
| 26 | SW. ¼, SW. ¼ SE. ¼, N. ½ SE. ¼, S. ½ NE. ¼ | | | | | 360 |
| 27 | S. ½ | 320 | | | | |
| 28 | S. ½ | 320 | | | | |
| 29 | S. ½ SE. ¼, NW. ¼, NW. ¼ NE. ¼ | 280 | | | | |
| 29 | N. ½ SE. ¼, SW. ¼ | | | | 240 | |
| 30 | SE. ¼, E. ½ SW. ¼, NE. ¼, SW. ¼ SW ¼ | 438 | | | | |
| 30 | NW. ¼ SW. ¼ | | | | | 38 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

UPPER SAINT CROIX DAM—Continued.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 44, *range* 12—Continued. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 19 | S. ½ SE. ¼ | 80 | | | | |
| 31 | N. ½, SE. ¼, N. ½ SW. ¼, SE. ¼ SW. ¼ | 600 | | | | |
| 32 | S. ½ SE. ¼, N. ½ NE. ¼, SW. ¼ | 320 | | | | |
| 32 | SE. ¼ NW. ¼, N. ½ SE. ¼ | | | 120 | | |
| 32 | S. ½ NE. ¼, N. ½ NW. ¼, SW. ¼ NW. ¼ | | | | | 200 |
| 33 | N. ½, N. ½ S. ½ | 480 | | | | |
| 33 | S. ½ S. ½ | | | | 160 | |
| 34 | N. ½, N. ½ S. ½ | 480 | | | | |
| 34 | S. ½ S. ½ | | | | 160 | |
| 35 | All | 640 | | | | |
| 36 | N. ½, SW. ¼, N. ½ SE. ¼ | 560 | | | | |
| 36 | S. ½ SE. ¼ | | | | | 80 |
| | *Township* 43, *range* 12. | | | | | |
| 1 | N. ½ NW. ¼ | | | | 84 | |
| 2 | N. ½ NE. ¼, N. ½ NW. ¼ | | | | | 168 |
| 3 | NE. ¼ NE. ¼ | | | | 41 | |
| 5 | NW. ¼ NW. ¼ | | | | 39 | |
| 6 | N. ½ NE. ¼ | | | | | 79 |
| | *Township* 44, *range* 11. | | | | | |
| 19 | W. ½ NE. ¼, SW. ¼ NE. ¼, SE. ¼, S. ½ SW. ¼, NE. ¼ SW. ¼. | 400 | | | | |
| 19 | NW. ¼ NE. ¼ | | | | 40 | |
| 20 | SW. ¼ NE. ¼, W. ½ | 360 | | | | |
| 20 | W. ½ SE. ¼ | | | | | 80 |
| 29 | NW. ¼ NW. ¼ | 40 | | | | |
| 29 | NE. ¼ NW. ¼, SW. ¼ NW. ¼ | | | | 80 | |
| 30 | N. ½, SW. ¼, W. ½ SE. ¼, NE. ¼ SE. ¼ | 616 | | | | |
| 30 | SE. ¼ SE. ¼ | | | | | 40 |
| 31 | W. ½ NW. ¼, NE. ¼ NW. ¼ | 126 | | | | |
| 31 | SW. ¼, SE. ¼ NW. ¼, NW. ¼ NE. ¼ | | | | 242 | |
| 6 | SW. ¼, SW. ¼ NW. ¼, SW. ¼ SE. ¼ | 264 | | | | |
| 7 | N. ½ NW. ¼, SE. ¼ NW. ¼, NE. ¼, SE. ¼ SE. ¼ | 328 | | | | |
| 7 | N. ½ SE. ¼, SW. ¼ SE. ¼ | 120 | | | | |
| 8 | SW. ¼ NE. ¼, E. ½ NW. ¼, W. ½ SE. ¼, SW. ¼ | 360 | | | | |
| 8 | NW. ¼ NE. ¼, SE. ¼ SE. ¼ | | | | | 80 |
| 17 | W. ½, W. ½ E. ½ | 480 | | | | |
| 17 | E. ½ E. ½ | | | | 160 | |
| 18 | E. ½ NE. ¼, E. ½ SE. ¼ | 160 | | | | |
| | *Township* 44, *range* 12. | | | | | |
| 1 | E. ½, S. ½ NW. ¼, NW. ¼ NW. ¼, NE. ¼ SW. ¼ | | | | 482 | |
| 1 | Lot 2 | | | | 25 | |
| 2 | NE. ¼ NE. ¼ | | | | | 41 |
| 12 | NE. ¼ NE. ¼ | | | | | 40 |
| | *Township* 45, *range* 12 *west of the 4th M.* | | | | | |
| 13 | SE. ¼ | | | | 160 | |
| 24 | Lots 2, 3, 4, 5, NW. ¼ NE. ¼, SE. ¼ NW. ¼ | 241 | | | | |
| 24 | NE. ¼ SW. ¼ | | | 40 | | |
| 25 | Lots 1, 2, 3, 4, 5, 6, 7, W. ½ NW. ¼ | | | | 455 | |
| 36 | Lots 1, 2, 3, 4, 5, 6, 7 | | | | | 334 |
| | *Township* 45, *range* 11. | | | | | |
| 17 | N. ½ NW. ¼, SW. ¼ NW. ¼ | 120 | | | | |
| 17 | SE. ¼ NW. ¼, W. ½ SW. ¼ | | | | 120 | |
| 18 | NW. ¼, N. ½ NE. ¼, NW. ¼ SW. ¼ | 280 | | | | |
| 18 | Lots 5, 6 | | | | | 81 |
| 18 | Lots 1, 2, 3, 4 | 166 | | | | |
| 19 | Lots 3, 5 | 75 | | | | |
| 19 | SW. ¼ NE. ¼, lot 2, E. ½ NE. ¼ | | | | 176 | |
| 19 | Lot 4, SE. ¼ SW. ¼ | | | | 100 | |
| | Total | 9,894 | | 180 | 2,964 | 1,761 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

LOWER NAMEKAGON DAM.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 42, *range* 14. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 25 | NW. ¼ SE. ¼, S. ½ NW. ¼ NE. ¼, N. ½ SW. ¼ NE. ¼ | | | | 120 | |
| 25 | NW. ¼, SW. ¼ | | | | 320 | |
| 26 | W. ½ SW. ¼, SE. ¼ SW. ¼, N. ½ SE. ¼ | | | 200 | | |
| 26 | SE. ¼ NE. ¼, S. ½ SW. ¼ NE. ¼, S. ½ NW. ¼ | | | | | 140 |
| 26 | NW. ¼ NW. ¼, NE. ¼ SW. ¼, S. ½ SE. ¼ | | | | | 160 |
| 27 | NE. ¼ NE. ¼, E. ½ SE. ¼ NE. ¼, S. ½ NE. ¼ SW. ¼ | | | | 80 | |
| 27 | SE. ¼ SW. ¼, SE. ¼ | | | | 200 | |
| 33 | NE. ¼ NE. ¼ | | | | 40 | |
| 34 | N. ½, W. ½ SE. ¼, NE. ¼ SE. ¼, SE. ¼ SE. ¼ | | | | | 480 |
| 35 | W. ½, NE. ¼, NW. ¼ SE. ¼ | | | | 520 | |
| 36 | NW. ¼ NW. ¼ | | | 40 | | |
| 36 | E. ½ NW. ¼, SW. ¼ NW. ¼, N. ½ SW. ¼, NW¼ NE. ¼ | | | | | 240 |
| 36 | S. ½ NE. ¼, N. ½ NE. ¼ SE. ¼, N. ½ N. W. ¼ SE. ¼ | | | | | 120 |
| | *Township* 42, *range* 13. | | | | | |
| 31 | N. ½ S. ½, E. ½ NW. ¼, SW. ¼ NW. ¼, W. ½ NE. ¼ | | | | 360 | |
| 30 | W. ½ SE. ¼, NE. ¼ SE. ¼ | | | | | 120 |
| 32 | SW. ¼, S. ½ SE. ¼ | | | | | 240 |
| 33 | S. ½ SW. ¼ SW. ¼, S. ½ SE. ¼ | | | | 100 | |
| | *Township* 41, *range* 14. | | | | | |
| 1 | W. ½ NE. ¼, NW. ¼, S. ½ | | | | 560 | |
| 2 | S. ½ NE. ¼, SE. ¼ NW. ¼, W. ½ NW. ¼, S. ½ | | | | | 520 |
| 12 | NE. ¼, NE. ¼ NW. ¼, SE. ¼, SE. ¼ SW. ¼ | | | | | 400 |
| 3 | NE. ¼ SE. ¼, S. ½ SE. ¼, SE. ¼ SW. ¼ | | | | 160 | |
| 8 | Lots 1, 3, 4, 5, 6 | | | | | 181 |
| 9 | NE. ¼ NW. ¼, lots 2, 3, 4, 5, NE. ¼ | | | | 412 | |
| 9 | NE. ¼ SE. ¼ | | | | 40 | |
| 10 | NE. ¼ NW. ¼, S. ½ NW. ¼, NE. ¼, N. ½ SW. ¼ | | | | | 360 |
| 10 | NW. ¼ SE. ¼ | | | 40 | | |
| 10 | E. ½ SE. ¼, SW. ¼ SE. ¼ | | | | | 120 |
| 11 | NW. ¼ NW. ¼ | 40 | | | | |
| 11 | N. ½ SW. ¼, SW. ¼ NW. ¼ | | | | 120 | |
| 16 | Lots 2, 3, 4. 5, 6, 7, SW. ¼ NE. ¼ | | 239 | | | |
| 17 | Lots 1, 2, 3, 4, 6, 7 | | | | 216 | |
| 18 | S. ½ NE. ¼, SE. ¼ | | | | | 240 |
| 19 | E. ½ SW. ¼, lots 1, 2, 3 | | | | 214 | |
| 20 | Lot 5 | | | 60 | | |
| 20 | N. ½ NE. ¼, lots 1, 2, 3, 4, 6 | | | | | 273 |
| 21 | Lots 1, 2, 3, SW. ¼ NW. ¼, SW. ¼ NE. ¼, E. ½ NE. ¼ | | | | 254 | |
| | *Township* 41, *range* 13. | | | | | |
| 4 | N. ½ NE. ¼, SE. ¼ NE. ¼, N. ½ NW. ¼ | | | | | 206 |
| 5 | N. ½ NE. ¼ | | | | 82 | |
| 6 | S. ½ SW. ¼ | | | | | 80 |
| 7 | W. ½, SE. ¼, S. ½ NE. ¼ | | | | 593 | |
| 18 | NW. ¼ | | | | | 172 |
| 8 | S. ½ SW. ¼, SW. ¼ SE. ¼ | | | | | 120 |
| 17 | N. ½ NW. ¼, W. ½ NE. ¼, SE. ¼ NE. ¼, SE. ¼ | | | | 360 | |
| 20 | E. ½ NE. ¼, W. ½ SE. ¼ | | | | | 160 |
| 21 | W. ½ NW. ¼, W. ½ SW. ¼ | | | | 160 | |
| 28 | NW. ¼ SW. ¼ | | | 40 | | |
| 28 | NW. ¼, SW. ¼ NE. ¼, NE. ¼ SW. ¼, SE. ¼ SW. ¼ | | | | | 320 |
| 28 | W. ½ SE. ¼ | | | | | 80 |
| | Total | 40 | 239 | 380 | 4, 911 | 4, 732 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

EAU CLARE DAM.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 44 *north, range* 9 *west of the* 4*th M.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 8 | Lots 1, 3, 4, 5, 6 | 192 | | | | |
| 7 | Lot 1 | | | | 37 | |
| 9 | Lot 11 | | | | 39 | |
| 16 | NE. ¼ SW. ¼, S. ½ SW. ¼, lot 5 | | 160 | | | |
| 17 | Lots 1, 2, 3, 5, 6 | | | | 155 | |
| 18 | SE. ¼ SW. ¼ | | | 40 | | |
| 18 | SE. ¼ lots 1, 2 | | | | | 247 |
| 19 | N. ½ NE. ¼, lots 1, 2, 3, 4 | | | | 271 | |
| 20 | NE. ¼ SE. ¼, lots 1, 2, 4, 5 | | | | | 221 |
| 21 | NW. ¼ NW. ¼ | | | | 40 | |
| 30 | SW. ¼ SW. ¼ | 42 | | | | |
| 30 | W. ½ NE. ¼, SE. ¼ SW. ¼, NW. ¼ SE. ¼ | | | 166 | | |
| 30 | NW. ¼ SW. ¼, SW. ¼ SE. ¼, lots 3, 4 | | | | | 186 |
| 31 | N. ½ NW. ¼, NW. ¼ NE. ¼ | | | | 122 | |
| | *Township* 44, *range* 10. | | | | | |
| 24 | Lots 1, 2, 3 | | | | | 112 |
| 25 | Lots 1, 2, 3, 4, 5, 6, 7, 8 | | | | 344 | |
| 36 | E. ½ NW. ¼, NW. ¼ NE. ¼, lot 1 | | | 159 | | |
| 36 | NE. ¼ NE. ¼, S. ½ NE. ¼, SW. ¼ NW. ¼ | | | | | 160 |
| | Total | 234 | 160 | 365 | 1,008 | 926 |

UPPER TOTOGATIC DAM.

| | | | | | | |
|---|---|---|---|---|---|---|
| | *Township* 42, *range* 10. | | | | | |
| 12 | S. ½ SE. ¼ | | | 80 | | |
| 13 | E. ½ NE. ¼ | 80 | | | | |
| 13 | W. ½ NE. ¼, N. ½ SE. ¼, SE. ¼ SE. ¼ | | | | 200 | |
| 24 | SE. ¼ NE. ¼ | | | 40 | | |
| 24 | NE. ¼ NE. ¼ | | | | | 40 |
| | *Township* 42, *range* 9. | | | | | |
| 7 | SW. ¼ SW. ¼ | 43 | | | | |
| 7 | SE. ¼ SW. ¼, SW. ¼ SE. ¼ | | | | 80 | |
| 8 | SE. ¼ SW. ¼ | 40 | | | | |
| 17 | NW. ¼, S. ½ SW. ¼ | | | | 240 | |
| 18 | All | 653 | | | | |
| 19 | N. ½, N. ½ S. ½ | | | | 491 | |
| 20 | NW. ¼, W. ½ SW. ¼ | 240 | | | | |
| 20 | E. ½ SE. ¼, S. ½ SW. ¼ | | | 160 | | |
| 20 | SW. ¼ NE. ¼, W. ½ SE. ¼ | | | | | 120 |
| 21 | S. ½ SW. ¼, SW. ¼ SE. ¼ | | | | 120 | |
| 23 | All | | | | 640 | |
| 25 | W. ½ NW. ¼, W. ½ SW. ¼ | | | | 160 | |
| 26 | NE. ¼, N. ½ NW. ¼, SE. ¼ NW. ¼, E. ½ SE. ¼ | 360 | | | | |
| 26 | SW. ¼ NW. ¼ | | | | | 40 |
| 27 | W. ½ NW. ¼, S. ½ SE. ¼, SW. ¼ | | | | 320 | |
| 28 | SE. ¼ NE. ¼, SW. ¼ N. ½ | 560 | | | | |
| 28 | NW. ¼ SW. ¼ | | | | | 40 |
| 29 | NE. ¼ NW. ¼ SE. ¼, E. ½ NW. ¼, NE. ¼ SW. ¼ | | | | 320 | |
| 33 | N. ½ NE. ¼ | | | | 80 | |
| 34 | NE. ¼, N. ½ NW. ¼ | 240 | | | | |
| 34 | NE. ¼ SE. ¼ | | | | | 40 |
| 35 | E. ½ NE. ¼, SW. ¼ NE. ¼, N. ½ SE. ¼ | | | | 200 | |
| 35 | N. ½ SW., SE. ¼ NW. ¼, W. ½ NW. ¼ | | | | 200 | |
| 36 | W. ½ NW. ¼ | | | | | 80 |
| | Total | 2,216 | | 280 | 3,051 | 360 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

GILLMORE LAKE DAM.

| Section. | Description. | Transferred to the State of Wisconsin. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 43 *north, range* 12. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 33 | W. ½ SE. ¼, S. ½ SW. ¼ | | | | 160 | |
| 32 | E. ½ SE. ¼ W. ½ | | | | | 400 |
| 31 | All | | | | 663 | |
| 30 | SW. ¼ SW. ¼ NE. ¼ | | | | | 217 |
| 19 | Lot 12, NW. ¼ NW. ¼ | | | | 125 | |
| 18 | SW. ¼ | | | | | 170 |
| | *Township* 43 *north, range* 13 *west of the 4th M.* | | | | | |
| 36 | All | | | | | 640 |
| 25 | SE. ¼ NW. ¼, SE. ¼ NE. ¼, lots 1, 2 | | | | 453 | |
| 24 | NW. ¼ NE. ¼, lots 1, 5, 7 | | | | | 126 |
| | *Township* 42, *range* 13. | | | | | |
| 1 | SE. ¼ SE. ¼ | 40 | | | | |
| 1 | N. ½ SW. ¼, N. ½ SE. ¼, SW. ¼ SE. ¼ | | | | 600 | |
| 12 | N. ½ SE. ¼, E. ½ SW. ¼ | | | | | 560 |
| 13 | NE. ¼ | | | | 160 | |
| | *Township* 42 *north, range* 12. | | | | | |
| 4 | NW. ¼ SE. ¼ | | | 40 | | |
| 4 | N. ½, NE. ¼ SE. ¼, S. ½ SE. ¼, W. ½ NE. ¼ | | | | | 522 |
| 5 | NE. ¼, N. ½ NW. ¼ | | | | 242 | |
| 10 | N. ½, N. ½ SW. ¼ | | | | | 400 |
| 9 | N. ½ NE. ¼, SE. ¼ NE. ¼, lots 1, 2, 3, 4, 5, 6, 7, 8 | | | | 431 | |
| 6 | SW. ¼ SW. ¼ | 40 | | | | |
| 6 | NW. ¼, N. ½ SW. ¼, SE. ¼ SW. ¼, W. ½ SE. ¼ | | | | | 383 |
| 8 | Lots 1, 2, 3, 4 | | | | | 190 |
| 15 | NW. ¼ NW. ¼ | 40 | | | | |
| 15 | W. ½ SW. ¼, SW. ¼ NW. ¼ | | | | 120 | |
| 16 | NW. ¼ SW. ¼, lots 1, 2, 3, 4, 5 | | 238 | | | |
| 17 | Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 | | | | 348 | |
| 18 | E. ½ SE. ¼, E. ½ NE. ¼ | | | | | 160 |
| 19 | E. ½ NE. ¼ | | | | 80 | |
| 20 | SW. ¼ NW. ¼, lots 1, 2, 3, 4, 5 | | | | | 206 |
| | Total | 120 | 238 | 40 | 3,382 | 3,974 |

CHENGWATANA DAM.

| Section. | Description. | Transferred to the State of Minnesota. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 39, *range* 21 *west of the 4th M.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 2 | E. ½ SW. ¼, W. ½ SE. ¼, SE. ¼ NW. ¼ | | | 200 | | |
| 10 | SE. ¼ NE. ¼, NE. ¼ SE. ¼ | | | 80 | | |
| 11 | S. ½ NE. ¼, NW. ¼ NE. ¼, S. ½ NW. ¼, NE. ¼ NW ¼ | | | 240 | | |
| 11 | Lots 1, 2, 3, 4, 5 | | | 140 | | |
| 14 | Lots 2, 3, 4, 5, 6 | | | 241 | | |
| 15 | Lots 2, 3, 4 | | | 109 | | |
| 19 | W. ½ SE. ¼, E. ½ SW. ¼, SW. ¼ NE. ¼, SE. ¼ NW. ¼ | | | 240 | | |
| 20 | S. ½ NE. ¼ | | | 480 | | |
| 20 | SE. ¼ NW. ¼ | | | | | 40 |
| 21 | N. ½ SW. ¼, N. ½ SE. ¼, SE. ¼ NE. ¼ | 200 | | | | |
| 21 | NW. ¼, S. ½ SW. ¼, S. ½ SE. ¼, SW. ¼ NE. ¼ | | | 360 | | |
| 22 | Lots 1, 2, 3, 4, 5 | | | 218 | | |
| 23 | Lots 1, 2, 3, 4, E. ½ SW. ¼ | | | 270 | | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

CHENGWATANA DAM—Continued.

| Section. | Description. | Transferred to the State of Minnesota. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 39, *range* 21 *west of the* 4th *M.*—Cont'd. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 26 | NW. ¼, NW. ¼ SW. ¼ | | | 198 | | |
| 27 | Lots 1, 2, 3, 4, 5, 6, 7 | | | 286 | | |
| 28 | Lots 1, 2, W. ½, NW. ¼ NE. ¼ | | | 428 | | |
| 29 | Lot 2, SE. ¼ SE. ¼ | 69 | | | | |
| 29 | Lot 1, N. ½, N. ½ S. ½, SW. ¼ SW. ¼ | | | 558 | | |
| 30 | N. ½ N. ½, SW. ¼ SE. ¼, SW. ¼ SE. ¼ | | | 583 | | |
| 30 | SW. ¼ SW. ¼ | | | | | 35 |
| 31 | Lots 1, 2, 3, 4, 5, E. ½ NW. ¼, S. ½ SE. ¼ | | | 397 | | |
| 31 | W. ½ W. ½, SE. ¼ SW. ¼ | | | | 180 | |
| 32 | Lot 1 | 10 | | | | |
| 32 | Lots 2, 3, 4, 5, 6 | | | 194 | | |
| 33 | Lots 1, 2 (R. R.); lots 3, 6, 7 (E) | | | 116 | 45 | |
| 34 | Lots 1, 2, 3, 4, W. ½ NE. ¼ | | | 252 | | |
| | *Township* 39, *range* 22 *west of the* 4th *M.* | | | | | |
| 1 | W. ½ NE. ¼, S. ½ NW. ¼, W. ½ SE., SW. ¼ | | | 401 | | |
| 1 | NE. ¼ NW | | | 41 | | |
| 9 | SE. ¼ | | | 160 | | |
| 10 | S. ½ S. ½ | | | 160 | | |
| 11 | S. ½, NE. ¼ NE. ¼ (E), SE. ¼ NE. ¼ (R. R.) | | | 360 | 40 | |
| 12 | NW. ¼, W. ½ SW. ¼ | | | 240 | | |
| 13 | Lots 1, 2, 3, 4, NW. ¼ NW. ¼ | | | 209 | | |
| 14 | N. ½, W. ½ SW. ¼, NE. ¼ SW. ¼, lots 1, 2 | | | 533 | | |
| 15 | SE. ¼, N. ½ N. ½, SE. ¼ NW. ¼ | | | 360 | | |
| 15 | SW. ¼ NW. ¼, SE. ¼ NE. ¼ | | | | 80 | |
| 23 | Lots 1, 2, 3, 4 | | | 141 | | |
| 24 | Lots 1, 2, 3, 4 | | | 162 | | |
| 25 | Lots 1, 2, 3, 4, E. ½ E. ½, SW. ¼ SE. ¼ | | | 365 | | |
| 26 | Lot 4, SW. ¼ SW. ¼ | | | 90 | | |
| 27 | S. ½ SE. ¼, SE. ¼ SW. ¼ | | | 120 | | |
| 32 | SE. ¼ NE. ¼, E. ½ SE. ¼ | | | 120 | | |
| 33 | All | 640 | | | | |
| 34 | W. ½ NE. ¼, SE. ¼ NE. ¼, NW. ¼, E. ½ SW. ¼ | | | 360 | | |
| 34 | NE. ¼ NE. ¼ | 40 | | | | |
| 34 | SW. ¼ SW. ¼, SE. ¼ | | | 200 | | |
| 34 | NW. ¼ SW. ¼ | | | | | 40 |
| 35 | Lots 1, 2, 3, 4, SW. ¼, SW. ¼ SE. ¼, W. ½ NW. ¼ | | | 438 | | |
| 36 | Lots 1, 2, 3, 4, E. ½, E. ½ SW. ¼ | | 549 | | | |
| | *Township* 38, *range* 22 *west of the* 4th *M.* | | | | | |
| 1 | W. ½ NE. ¼, E. ½ SE. ¼, SW. ¼ SE. ¼ | | | 605 | | |
| 1 | NW. ¼ SE. ¼ | | | | 40 | |
| 2 | All | | | 633 | | |
| 3 | All | | | 630 | | |
| 9 | S. ½, SE. ¼ NE. ¼ | | | 360 | | |
| 10 | All | | | 640 | | |
| 11 | SW. ¼ NW. ¼ | 40 | | | | |
| 11 | NE. ¼, E. ½ NW. ¼, NW. ¼ NW. ¼, N. ½ SW. ¼ | | | 360 | | |
| 12 | SE. ¼ NW. ¼ | 40 | | | | |
| 12 | N. ½ N. ½, SW. ¼ NW. ¼ | | | 200 | | |
| 7 | SW. ¼ | | | 91 | | |
| 8 | S. ½ SE. ¼ | 80 | | | | |
| 17 | E. ½ NW. ¼ | | | 480 | | |
| 18 | W. ½ NE. ¼ | 80 | | | | |
| 18 | W. ½, W. ½ SE. ¼, E. ½ NE. ¼ | | | 246 | | |
| 19 | S. ½ SW. ¼ | 48 | | | | |
| 19 | W. ½ E. ½ (E), NW. ¼, N. ½ SW. ¼ (R) | | | 257 | 48 | |
| 30 | W. ½ | 193 | | | | |
| 30 | W. ½ SE. ¼ | | | 160 | | |
| | *Township* 38, *range* 23. | | | | | |
| 2 | SW. ¼ NW. ¼, SW. ¼ SW. ¼ | 80 | | | | |
| 2 | N. ½ NW. ¼ | | | 80 | | |
| 2 | NW. ¼ SW. ¼ | | | | | 40 |
| 3 | SE. ¼ NE. ¼, NE. ¼ SE. ¼ | 80 | | | | |
| 3 | NW. ¼ SE. ¼, SE. ¼ SE. ¼ | | | | 80 | |
| 4 | SW. ¼ SE. ¼, E. ½ SW. ¼ | | | 120 | | |
| 9 | NE. ¼ NE. ¼ | | | | 40 | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued

CHENGWATANA DAM—Continued.

| Section. | Description. | Transferred to the State of Minnesota. | | Transferred to private parties and corporations. | | United States lands. |
|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | |
| | *Township* 38, *range* 23 *west*—Continued. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 10 | N. ½ SE. ¼, S. ½ NE. ¼, N. ½ NW. ¼, SE. ¼ NW. ¼ | | | 280 | | |
| 10 | NE. ¼ SW. ¼, SW. ¼ SW. ¼ | | | 80 | | |
| 10 | NW. ¼ SW. ¼ | | | | | 40 |
| 11 | NW. ¼ SW. ¼, SW. ¼ NW. ¼ | | | 80 | | |
| 11 | NW. ¼ NW. ¼, E. ½ SW. ¼, SW. ¼ SE. ¼ | | | | 160 | |
| 12 | S. ½ S. ½ | | | 160 | | |
| 13 | NW. ¼ NW. ¼ | | | | 40 | |
| 14 | N. ½ NE. ¼ | | | 80 | | |
| 15 | W. ½ W. ½ | | | | 160 | |
| 16 | E. ½ E. ½ | | 160 | | | |
| 21 | W. ½ SE. ¼, SW. ¼ NE. ¼, E. ½ NE. ¼, SE. ¼ SW. ¼ | 240 | | | | |
| 21 | E. ½ SE. ¼, NW. ¼ NE. ¼, NE. ¼ SW. ¼ | | | | 160 | |
| 28 | E. ½ NW. ¼, W. ½ NE. ¼, SE. ¼ | | | 320 | | |
| | Total | 1,840 | 709 | 15,912 | 1,073 | 195 |

GROUND HOUSE DAM.

| | | | | | | |
|---|---|---|---|---|---|---|
| | *Township* 38, *range* 24 *west.* | | | | | |
| 7 | S. ½ SW. ¼ | | | 74 | | |
| | *Township* 38, *range* 25. | | | | | |
| 1 | W. ½ SE. ¼, E. ½ NW. ¼, E. ½ SW. ¼ | | | 240 | | |
| 12 | E. ½ | | | 320 | | |
| 13 | N. ½ NE. ¼, SW. ¼ NE. ¼, S. ½ NW. ¼, SW. ¼ | | | 360 | | |
| 14 | SE. ¼, SE. ¼ SW. ¼ | | | 200 | | |
| 18 | S. ½ SW. ¼ | | | 80 | | |
| 19 | N. ½, N. ½ SE. ¼ | | | 403 | | |
| 20 | E. ½ | | | 320 | | |
| 21 | SE. ¼, W. ½ NE. ¼ | | | 240 | | |
| 22 | SE. ¼, E. ½ N. E. ¼, SW. ¼ NE ¼, E. ½ SW. ¼ | | | 360 | | |
| 23 | E. ½ NW. ¼, SW. ¼ NW. ¼, NW. ¼ SW. ¼ | | | 160 | | |
| 23 | NW. ¼ NW. ¼ | | | | 40 | |
| 27 | NW. ¼ | | | 160 | | |
| 28 | S. ½ SE. ¼ | 80 | | | | |
| 28 | NE. ¼, S. ½ NW. ¼, N. ½ S. ½ | | | 400 | | |
| 28 | S. ½ SW. ¼ | | | | | 80 |
| 29 | N. ½ SE. ¼, E. ½ NE. ¼, NW. ¼ NE. ¼, NW. ¼ | | | 360 | | |
| 29 | SW. ¼ NE. ¼ | | | | 40 | |
| 30 | E. ½ NE. ¼ | | | 80 | | |
| 32 | SE. ¼ E. ½ NE. ¼, SW. ¼ NE. ¼, SE. ¼ N. W. ¼, E. ½ SW. ¼ | 400 | | | | |
| 33 | All | 640 | | | | |
| 34 | W. ½ | 320 | | | | |
| | *Township* 39 *north, range* 25 *west of the 4th M.* | | | | | |
| 16 | SW. ¼, W. ½ SE. ¼, W. ½ NW. ¼ | | 320 | | | |
| 17 | W. ½ NE. ¼, university | | | 80 | | |
| 21 | SE. ¼, W. ½ NE. ¼, NE. ¼ NW. ¼, university | | | 280 | | |
| 22 | S. ½ SW. ¼, university | | | 80 | | |
| 25 | SW. ¼ NW. ¼, university | | | 40 | | |
| 25 | W. ½ SW. ¼ | | | | 80 | |
| 26 | SE. ¼ NE. ¼, S. ½, university | | | 360 | | |
| 27 | SE. ¼ W. ½, NE. ¼ NE. ¼, SW. ¼ NW. ¼, university | | | 440 | | |
| 28 | NE. ¼ NE. ¼, university | | | 40 | | |
| 34 | NE. ¼ NE. ¼ | | | 40 | | |
| 35 | N. ½ NW. ¼, NE. ¼ SE. ¼, N. ½ NE. ¼, SE. ¼ NE. ¼ | | | 240 | | |
| 36 | W. ½ | | 320 | | | |
| | Total | 1,440 | 640 | 5,357 | 160 | |

NOTE.—Abstract of flowed lands of proposed reservoirs at Chengwatana and Ground House are approximate.

*Summary of lands and approximate areas which will be flowed by proposed reservoirs on the Saint Croix River and tributaries.*

| Location. | Swamp lands. | School lands. | Entered lands. | Railroad lands. | United States lands. | At each reservoir, total lands. |
|---|---|---|---|---|---|---|
| IN STATE OF WISCONSIN. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| Rice Lakes | 623 | 400 | 123 | 1,829 | 949 | 3,924 |
| Yellow Lake | 841 | ..... | 578 | ..... | 4,673 | 6,092 |
| Clam Lake | 1,246 | 85 | 709 | 4,353 | 2,579 | 8,972 |
| Head of Kettle River Rapids | 5,645 | ..... | 2,415 | 160 | 259 | 8,479 |
| Veazie's | 120 | ..... | 183 | 2,633 | 3,031 | 5,967 |
| Upper Saint Croix | 9,894 | ..... | 180 | 2,964 | 1,761 | 14,799 |
| Lower Namekagon | 40 | 239 | 380 | 4,911 | 4,732 | 10,302 |
| Eau Claire Lake | 234 | 160 | 365 | 1,008 | 926 | 2,693 |
| Upper Totogatic | 2,216 | ..... | 280 | 3,051 | 360 | 5,907 |
| Gilmore Lake | 120 | 238 | 40 | 3,382 | 3,974 | 7,754 |
| IN STATE OF MINNESOTA. | | | | | | |
| Chengwatana | 1,840 | 709 | 15,912 | 1,073 | 195 | 19,729 |
| Ground House | 1,440 | 640 | 5,357 | 160 | ..... | 7,597 |
| Total | 24,259 | 2,471 | 26,522 | 25,524 | 23,439 | 102,215 |

NOTE.—Approximately correct.

## APPENDIX *l*.

### TABLE I.—CHIPPEWA RIVER.

| Stream on which proposed dam is located. | Name of reservoir. | Area of watershed to reservoir. | | Supply from one-third of 30 inches rainfall. | Capacity of reservoir. | Surplus over capacity of reservoir. | Supply from reservoir for 90 days. | Length of dam. | Length of dike. | Maximum height of dam above low-water. | Maximum height of dike. | Cost of dam, including dike. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Sq. miles.* | *Square feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *C. ft p. sec.* | *Lin. ft.* | *Lin. ft.* | *L. ft.* | *L. ft.* | |
| East Fork Chippewa River | Bear Lake | 244. 50 | 6, 816, 268, 800 | 5, 677, 951, 910 | 1, 113, 148, 856 | 4, 564, 803, 054 | 143. 15 | 1, 015 | 200 | 19. 5 | 8. 5 | $25, 925 |
| Do | Little Chief Lake | 57. 60 | 1, 605, 795, 840 | 1, 337, 627, 935 | 771, 332, 009 | 566, 295, 926 | 99. 19 | 710 | ..... | 24. 0 | ..... | 40, 702 |
| West Fork Chippewa River | Moose Lake | 214. 30 | 5, 974, 341, 120 | { 4, 976, 626, 153 | 2, 021, 783, 402 | { 1, 234, 725, 814 | { 260. 00 | 1, 235 | 160 | 25. 7 | 1. 5 | 45, 090 |
| Do | Pa-kwa-wang | 257. 20 | 7, 170, 324, 480 | { 5, 972, 880, 292 | 7, 692, 997, 229 | | { 989. 33 | 900 | ..... | 25. 5 | ..... | 66, 449 |
| Courtes Oreilles | Courtes Oreilles | 114. 00 | 3, 178, 137, 600 | 2, 647, 388, 621 | 2, 647, 388, 621 | ..... | 340. 45 | 260 | P. 100 | 6. 5 | P. 5.0 | 2, 492 |
| Chippewa River | Paint Creek | 3, 943. 10 | 109, 927, 319, 040 | 91, 569, 456, 760 | 505, 336, 720 | 91, 064, 120, 040 | 64. 99 | 620 | ..... | 22. 0 | ..... | 60, 000 |
| Total | ..... | 4, 830. 70 | 134, 672, 186, 880 | 112, 181, 931, 671 | 14, 751, 986, 837 | 97, 429, 944, 834 | 1, 897. 11 | 4, 740 | 460 | ..... | ..... | 240, 658 |
| Butternut Creek | Butternut Lake | 40. 00 | 1, 115, 136, 000 | 928, 908, 288 | *585. 446, 400 | 343, 461, 888 | *75. 26 | 336 | ..... | *10. 0 | ..... | 5, 216 |
| Manitouish | Rest Lake | †211. 64 | †5, 900, 120, 800 | {*4, 897, 100, 264 | †1, 840, 000, 000 | { †757, 813, 112 | { †236. 62 | 250 | 75 | †15. 0 | 2. 5 | †7, 665 |
| North Fork Flambeau | Bear Creek | †154. 50 | †4, 307, 212, 800 | †3, 107, 280, 000 | †5, 406, 567, 152 | | { †695. 29 | †2, 500 | †2, 000 | †15. 0 | †10. 5 | †47, 500 |
| Doré Flambeau | Round Lake | †63. 00 | †1, 756, 339, 200 | †1, 382, 304, 000 | †1, 303, 036, 416 | †79. 267, 584 | †167. 57 | †170 | †250 | †10. 0 | †10. 0 | †10. 550 |
| Do | Squaw Lake | †39. 00 | †1, 087, 257, 600 | †864, 230, 400 | †731, 808, 000 | †132, 422, 400 | †94. 11 | †250 | ..... | †9. 0 | ..... | †4, 000 |
| Turtle River | Park Lake | *174. 00 | *4, 850, 841, 600 | *4, 026, 198, 428 | *620, 782, 720 | *3, 405, 415, 708 | 79. 83 | 297 | ..... | *15. 0 | ..... | 9, 941 |
| Grand total | ..... | 5, 512. 84 | 153, 689, 094, 880 | 127, 387, 953, 051 | 25, 239, 627, 525 | 102, 148, 325, 526 | 3, 245. 79 | 8, 543 | 2, 785 | ..... | ..... | 325, 530 |

NOTE.—The quantities marked thus (*) are taken from Assistant J. D. Skinner's report of 1878; and the quantities marked thus (†) are taken from Assistant J. D. Raynolds's report of 1879. (See reports alluded to.) The quantities are introduced here to show the surplus water passing at Paint Creek dam, the lowest dam in the system, as well as the total supply per second for 90 days, and the total cost of dams for the Chippewa River system of reservoirs. The quantities marked P. in the columns of dimensions of dikes denote here sheet-piling.

## APPENDIX *m*.

### TABLE II.—CHIPPEWA RIVER.

| Stream on which proposed dam is located. | Name of reservoir. | Area of watershed to reservoir. | | Supply from one-fourth of 30 inches rainfall. | Capacity of reservoir. | Surplus over capacity of reservoir. | Supply from reservoir for 90 days. | Length of dam. | Length of dike. | Maximum height of dam above low-water. | Maximum height of dike. | Cost of dam, including dike. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Sq. miles.* | *Square feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *C. ft. p. sec.* | *Lin. ft.* | *Lin. ft.* | *L. ft.* | *L. ft.* | |
| East Fork Chippewa River | Bear Lake | 244. 50 | 6, 816, 268, 800 | 4, 260, 168, 000 | 1, 113, 148, 856 | 3, 147, 019, 144 | 143. 15 | 1, 015 | 200 | 19. 5 | 8. 5 | $25, 925 |
| Do | Little Chief Lake | 57. 60 | 1, 605, 795, 840 | 1, 003, 622, 400 | 771, 332, 009 | 232, 290, 391 | 99. 19 | 710 | ..... | 24. 0 | .... | 40, 702 |
| West Fork Chippewa River | Moose Lake | 214. 30 | 5, 974, 341, 120 | { 3, 733, 963, 200 | 2, 021, 783, 402 | ..... | 260. 00 | 1, 235 | 160 | 25. 7 | 1. 5 | 45, 090 |
| Do | Pa-kwa-wang | 257. 20 | 7, 170, 324, 480 | { 4, 481, 452, 800 | 6, 193, 632, 598 | ..... | 796. 50 | 840 | .... | 23. 0 | ..... | 55, 617 |
| Courtes Oreilles | Courtes Oreilles | 114. 00 | 3, 178, 137, 600 | 1, 986, 336, 000 | 1, 986, 336, 000 | ..... | 255. 44 | 260 | P. 100 | 5. 0 | P. 5. 0 | 1, 631 |
| Chippewa River | Paint Creek | 3, 493. 10 | 109, 927, 319, 040 | 68, 704, 574, 400 | 505, 336, 720 | 68, 199, 237, 680 | 64. 99 | 620 | ..... | 22. 0 | ..... | 60, 000 |
| Total | | 4, 830. 70 | 134, 672, 186, 880 | 84, 170, 116, 800 | 12, 591, 569, 585 | 71, 578, 547, 215 | 1, 619. 27 | 4, 680 | 460 | ..... | ..... | 228, 965 |
| Butternut Creek | Butternut Lake | 40. 00 | 1, 115, 136, 000 | 696, 960, 000 | *585, 446, 400 | 111, 513, 600 | *75. 26 | 336 | ... ... | *10. 0 | ..... | 5, 216 |
| Manitouish | Rest Lake | †211. 64 | †5, 900, 120, 800 | {†3, 687, 615, 360 | †1, 840, 000, 000 | Excess of capacity of reservoirs over supply, 1,427,137,008. | †236. 62 | 250 | 75 | †15. 0 | 2. 5 | †7, 665 |
| North Fork Flambeau | Bear Creek | †154. 50 | †4, 307, 212, 800 | {†2, 450, 976, 000 | †5, 406, 567, 152 | | †552. 81 | †2, 500 | †2, 000 | †15. 0 | †10. 5 | †47, 500 |
| Doré Flambeau | Round Lake | †63. 00 | †1, 756, 339, 200 | †1, 057, 056, 000 | †1, 303, 036, 416 | | †135. 93 | †170 | †250 | †10. 0 | †10. 0 | †10, 550 |
| Do | Squaw Lake | †39. 00 | †1, 087, 257, 600 | †658, 627, 200 | †731, 808, 000 | | †84. 70 | †250 | ..... | †9. 0 | ..... | †4, 000 |
| Turtle River | Park Lake | *174. 00 | *4, 850, 841, 600 | 3, 031, 776, 000 | *620, 782, 720 | 2, 410, 993, 280 | 79. 83 | 297 | ..... | *15. 0 | ..... | 9, 941 |
| Grand total | | 5, 512. 84 | 153, 689, 094, 880 | 95, 753, 127, 360 | 23, 079, 210, 273 | 74, 101, 054, 095 | 2, 784. 42 | 8, 483 | 2, 785 | ..... | ..... | 313, 837 |

NOTE.—The quantities marked thus (*) are taken from Assistant J. D. Skinner's report of 1878, and the quantities marked thus (†) are taken from Assistant J. D. Raynolds's report of 1879. (See reports alluded to.) The quantities are introduced here to show the surplus water passing at Paint Creek dam, the lowest dam in the system, as well as the total supply per second for 90 days, and total cost of dams for the Chippewa River system of reservoirs. The quantities in the columns for dimensions of dikes, marked P., denote here sheet-piling.

## APPENDIX *n*.

### TABLE III.—CHIPPEWA RIVER.

| Stream on which proposed dam is located. | Name of reservoir. | Area of watershed to reservoir. | | Supply from one-third of 30 inches rainfall. | Capacity of reservoir. | Surplus over capacity of reservoir. | Supply from reservoir for 90 days. | Length of dam. | Length of dike. | Maximum height of dam above low-water. | Maximum height of dike. | Cost of dam, including dike. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Sq. miles.* | *Square feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *C. ft. p. sec.* | *Lin. ft.* | *Lin. ft.* | *L. ft.* | *L. ft.* | |
| East Fork Chippewa River | Bear Lake | 244.50 | 6,816,268,800 | 5,677,951,910 | 1,113,148,856 | Surplus from E. and W. Forks turned into Courtes Oreilles through a canal. | 143.15 | 1,015 | 200 | 19.5 | 8.5 | $25 925 |
| Do | Little Chief Lake | 57.60 | 1,605,795,840 | 1,337,627,935 | 771,332,009 | | 99.19 | 725 | ..... | 25.0 | ..... | 45,183 |
| West Fork Chippewa River | Moose Lake | 214.30 | 5,974,341,120 | 4,976,626,153 | 2,021,783,402 | | 260.00 | 1,235 | 160 | 25.7 | 1.5 | 45,090 |
| Do | Pa-kwa-wang | 257.20 | 7,170,324,480 | 5,972,880,292 | 7,692,997,229 | | 989.33 | 900 | ..... | 25.5 | ..... | 66,449 |
| Courtes Oreilles | Courtes Oreilles | 114.00 | 3,178,137,600 | 2,647,388,621 | 9,013,213,415 | | 1,159.16 | 415 | 2,850 | 20.0 | 13.5 | 36,752 |
| Chippewa River | Paint Creek | 3,943.10 | 109,927,319,040 | 91,569,456,760 | 505,336,720 | 91,064,120,040 | 64.99 | 620 | ..... | 22.0 | ..... | 60,000 |
| Total | | 4,830.70 | 134,672,186,880 | 112,181,931,671 | 21,117,811,631 | 91,064,120,040 | 2,715.82 | 4,910 | 3,210 | ..... | ..... | 279,399 |
| Butternut Creek | Butternut Lake | 40.00 | 1,115,136,000 | 928,908,288 | *585,446,400 | 343,461,888 | *75.26 | 336 | ..... | *10.0 | ..... | 5,216 |
| Manitouish | Rest Lake | †211.64 | †5,900,120,800 | *4,897,100,264 | †1,840,000,000 | †757,813,112 | †236.62 | 250 | 75 | †15.0 | 2.5 | †7,665 |
| North Fork Flambeau | Bear Creek | †154.50 | †4,307,212,800 | †3,107,280,000 | †5,406,567,152 | | †695.29 | †2,500 | †2,000 | †15.0 | †10.5 | †47,500 |
| Doré Flambeau | Round Lake | †63.00 | †1,756,339,200 | †1,382,304,000 | †1,303,036,416 | †79,267,584 | †167.57 | †170 | †250 | †10.0 | †10.0 | †10,550 |
| Do | Squaw Lake | †39.00 | †1,087,257,600 | †864,230,400 | †731,808,000 | †132,422,400 | †94.11 | †250 | ..... | †9.0 | ..... | †4,000 |
| Turtle River | Park Lake | *174.00 | *4,850,841,600 | *4,026,198,428 | *620,782,720 | *3,405,415,708 | 79.83 | 297 | ..... | *15.0 | ..... | 9,941 |
| Grand total | | 5,512.84 | 153,689,094,880 | 127,387,953,051 | 31,605,452,319 | 95,782,500,732 | 4,064.50 | 8,713 | 5,535 | ..... | ..... | 364,271 |

NOTE.—The quantities marked thus (*) are taken from Assistant J. D. Skinner's report of 1878; and the quantities marked thus (†) are taken from Assistant J. D. Raynolds's report of 1879. (See reports alluded to.) The quantities are introduced here to show the surplus water passing at Paint Creek dam, the lowest dam in the system; as well as the total supply per second for 90 days, and total cost of dams for the Chippewa River system of reservoirs.

## APPENDIX *o*.

### TABLE IV.—CHIPPEWA RIVER.

| tream on which proposed dam is located. | Name of reservoir. | Area of watershed to reservoir. | | Supply from one-fourth of 30 inches rainfall | Capacity of reservoir. | Surplus over capacity of reservoir. | Supply from reservoir for 90 days. | Length of dam. | Length of dike. | Maximum height of dam above low-water. | Maximum height of dike. | Cost of dam, including dike. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Sq. miles.* | *Square feet.* | *Cubic feet.* | *Cubic feet.* | *Cubic feet.* | *C. ft. p. sec.* | *Lin. ft.* | *Lin. ft.* | *L ft.* | *L ft.* | |
| East Fork Chippewa River | Bear Lake | 244. 50 | 6, 816, 268, 800 | 4, 260, 168, 000 | 1, 113, 148, 856 | Surplus from E. Fork turned into Pa-kwa-wang and Courtes Oreilles. | 143. 15 | 1, 015 | 200 | 19. 5 | 8. 5 | $25, 925 |
| Do | Little Chief Lake | 57. 60 | 1, 605, 795, 840 | 1, 003, 622, 400 | 771, 332 009 | | 99. 19 | 725 | ..... | 25. 0 | ..... | 45, 183 |
| West Fork Chippewa River | Moose Lake | 214. 30 | 5, 974, 341, 120 | 3, 733, 963, 200 | 2, 021, 783, 402 | | 260. 00 | 1, 235 | 160 | 25. 7 | 1. 5 | 45, 090 |
| Do | Pa-kwa-wang | 257. 20 | 7, 170, 324, 480 | 4, 481, 452, 800 | 7, 692, 997, 229 | | 989. 33 | 900 | ..... | 25. 5 | ..... | 66, 449 |
| Courtes Oreilles | Courtes Oreilles | 114. 00 | 3, 178, 137, 600 | 1, 986, 336, 000 | 3, 866, 280, 904 | | 497. 21 | 297 | 148 | 9. 4 | 3. 0 | 6, 254 |
| Chippewa River | Paint Creek | 3, 943. 10 | 109, 927, 319, 040 | 68, 704, 574, 400 | 505, 336, 720 | 68, 199, 237, 680 | 64, 99 | 620 | ..... | 22. 0 | ..... | 60, 000 |
| Total | | 4, 830. 70 | 134, 672, 186, 880 | 84, 170, 116, 800 | 15, 970, 879, 120 | 68, 199, 237, 680 | 2, 053. 87 | 4, 792 | 508 | ..... | ..... | 248, 901 |
| Butternut Creek | Butternut Lake | 40. 00 | 1, 115, 136, 000 | 696, 960, 000 | *585, 446, 400 | 111, 513, 600 | *75. 26 | 336 | ..... | *10. 0 | ..... | 5, 216 |
| Manatouish | Rest Lake | 211. 64 | †5, 900, 120, 800 | †3, 687, 615, 360 | †1, 840, 000, 000 | Excess of capacity of reservoirs over supply, 1,427,137,008, in ft. | †236. 62 | 250 | 75 | †15. 0 | 2. 5 | †7, 665 |
| North Fork Flambeau | Bear Creek | 154. 50 | †4, 307, 212, 800 | †2, 450, 976, 000 | †5, 406, 567, 152 | | †552. 81 | †2, 500 | †2, 000 | †15. 0 | †10. 5 | †47, 500 |
| Doré Flambeau | Round Lake | 63. 00 | †1, 756, 339, 200 | †1. 057, 056, 000 | †1, 303, 036, 416 | | †135. 93 | †170 | †250 | †10. 0 | †10. 0 | †10, 550 |
| Do | Squaw Lake | 39. 00 | †1, 087, 257, 600 | †658, 627, 200 | †731, 808, 000 | | †84. 70 | †250 | ..... | †9. 0 | ..... | †4, 000 |
| Turtle River | Park Lake | *174. 00 | *4, 850, 841, 600 | 3, 031, 776, 000 | *620, 782, 720 | 2, 410, 993, 280 | 79. 83 | 297 | ..... | *15. 0 | ..... | 9, 941 |
| Grand total | | 5, 512. 84 | 153, 689, 094, 880 | 95, 753, 127, 360 | 26, 458, 519, 808 | 70, 721, 744, 560 | 3, 219. 02 | 8, 595 | 2, 833 | ..... | ..... | 333, 773 |

NOTE.—The quantities marked thus (*) are taken from Assistant J. D. Skinner's Report of 1878; and the quantities marked thus (†) are taken from Assistant J. D. Raynold's Report of 1879. (See reports alluded to.) The quantities are introduced here to show the surplus water passing at Paint Creek dam, the lowest dam in the system, as well as the total supply per second for 90 days, and total cost of dams for the Chippewa River system of reservoirs.

## APPENDIX *p*.

### TABLE V.—CHIPPEWA RIVER.

*Discharge of tributaries to Chippewa River.*

| Station. | Date. | Height above low-water. | Width of river. | Area of cross-section. | Mean velocity, feet per second. | Discharge in cubic feet per second. |
|---|---|---|---|---|---|---|
| | 1879. | *Lin. ft.* | *Lin. ft.* | *Sq. ft.* | | |
| Below Bear Lake on East Fork of Chippewa River. | June 20 | 0.6 | 153.0 | 471.26 | 0.808 | 381.6 |
| | July 12 | 2.1 | 121.2 | 486.4 | 0.971 | 472.4 |
| *Below Little Chief Lake | Aug. 1 | ..... | 88.6 | 196.35 | 0.212 | 41.6 |
| At site for proposed dam at Pa-kwa-wang on West Fork of Chippewa River. | 6 | 0.2 | 121.0 | 193.32 | 1.983 | 383.4 |
| | | 0.2 | 121.0 | 193.32 | 1.839 | 355.5 |
| | | 0.2 | 121.0 | 193.32 | 1.858 | 359.3 |
| | | 0.2 | 121.0 | 193.32 | 1.824 | 352.6 |
| Below site for proposed dam at Moose Lake and below mouth of Tea River. | Sept. 29 | Low-water.. | 51.0 | 91.375 | 0.895 | 81.8 |
| | | ....do ..... | 51.0 | 91.375 | 0.921 | 84.2 |
| | | ....do ..... | 51.0 | 91.375 | 0.900 | 82.3 |
| | | ....do ..... | 51.0 | 91.375 | 0.911 | 83.2 |
| Tea River one mile below the outlet to Crop Lake. | 30 | ... do ..... | 35 | 57.175 | 0.530 | 30.3 |
| | | ....do ..... | 35 | 57.175 | 0.531 | 30.4 |
| | | ....do ..... | 35 | 57.175 | 0.524 | 30.0 |
| Tea River on West Fork | | ....do ..... | 35 | 57.175 | 0.528 | †30.2 |
| Below mouth of Tea River—discharge at dam-site on West Fork. | 29 | ....do ..... | 51 | 91.375 | 0.907 | ‡82.9 |
| | | ....do ..... | ..... | ..... | ..... | §52.7 |
| At outlet to Little Courtes Oreilles Lake... | Oct. 25 | 0.3 | 41 | 108.075 | 0.261 | 28.2 |
| | | 0.3 | 41 | 108.075 | 0.262 | 28.5 |

*Dam above closed. †Mean of three observations. ‡Mean of four observations. §Difference.

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## APPENDIX *q*.

### TABLE VI.—CHIPPEWA RIVER.

*Tables of elevations above sea-level.*

EAST FORK CHIPPEWA RIVER.

| | Elevation in feet. |
|---|---|
| Water at Chippewa Crossing, East Fork Chippewa River | 1,509.3 |
| Water in East Fork Chippewa River, in section 16, township 42 north, range 2 west (road crossing) | 1,487.7 |
| Water in East Fork Chippewa River, in section 19, township 42 north, range 2 west (foot of rapids) | 1 463.8 |
| Water in Pelican Lake | 1,462. |
| Water in Bear Lake | 1,432.9 |
| Water below proposed dam at Bear Lake | 1,430. |
| Water in East Fork Chippewa River, at head of Cedar Rapids | 1,420.0 |
| Water in East Fork Chippewa River, at head of Snaptail Rapids | 1,368.8 |
| Water in Blaisdell's Lake, nearly same as foot of Cedar Rapids | 1,374.5 |
| Water in Hunter's Lake | 1,325.2 |
| Water in Little Chief Lake | 1,323.4 |
| Water at dam-site, Little Chief Lake | 1,323.4 |

WEST FORK CHIPPEWA RIVER.

| | |
|---|---|
| Water in Partridge Crop Lake | 1,384.4 |
| Water in Summer Lake | 1,396.1 |
| Water in Moose Lake | 1,361.9 |
| Water below dam at Moose Lake | 1,358.8 |
| Water at mouth of Tea River | 1,352.9 |
| Water in Crop Lake | 1,384.8 |
| Water in Lost Lake | 1,385. |
| Water at mouth of Little Chief River | 1,287.2 |
| Water in Little Chief River at J. D. Haywood's dam | 1,292.7 |

| | Elevation in feet. |
|---|---|
| Water above dam | 1,293.8 |
| Water in Crane Lake | 1,300.7 |
| Water in Chief Lake | 1,295.7 |
| Water in Large Lake, in sections 26, 27, 34, 35, township 40, range 7 west | 1,305.9 |
| Water in Small Lake, in sections 34, 35, township 40 north, range 7 west | 1,306.9 |
| Water in Pokegama Lake | 1,290.5 |
| Water in West Fork Chippewa River above rapids, near dam-site | 1,286.0 |
| COURTES-OREILLES. | |
| Water in Lake Courtes Oreilles | 1,287.2 |
| Water in Grindstone Lake | 1,287.6 |
| Water in Island Lake | 1,292.0 |
| Water in lake in sections 34, 35, township 40 north, range 9 west | 1,290.6 |
| Water in lake in section 34, township 40 north, range 9 west | 1,292.9 |
| Water in Fish Lake | 1,288.7 |
| Water in Sand Lake | 1,301.1 |
| Water in Little Sand Lake | 1,303.8 |
| Water in Flat Lake | 1,320.3 |
| Water in Little Courtes Oreilles Lake, below dam-site | 1,286.4 |
| Water in Small Lake, section 33, township 40 north, range 8 west | 1,299.7 |

## APPENDIX *r*.

### TABLE VII.—CHIPPEWA RIVER.

*Table of distances from Eau Claire, by water.*

| To— | Miles. |
|---|---|
| Paint Creek, dam-site | 19 |
| Pa-kwa-wang, dam-site | 116 |
| Little Chief Lake, dam-site | 116.5 |
| Courtes Oreilles, dam-site | 118 |
| Moose Lake, dam-site | 130.5 |
| Bear Lake, dam-site | 131 |
| Butternut Lake, dam-site | 145 |
| Round Lake, dam-site | 172 |
| Squaw Lake, dam-site | 179.5 |
| Park Lake, dam-site | 191.5 |
| Bear Creek, dam-site | 196.5 |
| Rest Lake, dam-site | 221.5 |

## APPENDIX *s*.

### TABLE VIII.—CHIPPEWA RIVER.

*Table of lengths of "telegraph-line" necessary to be constructed to connect the proposed dam-sites at the different reservoirs at the sources of the Chippewa River with the nearest telegraph-line.*

| | Miles. |
|---|---|
| Chippewa Crossing, on line of Wisconsin Central Railroad, to Bear Lake | 16 |
| Bear Lake to Little Chief Lake | 12 |
| Little Chief Lake to Pa-kwa-wang | 3 |
| Pa-kwa-wang to Moose Lake | 9 |
| Pa-kwa-wang to Courtes Oreilles | 16 |
| Butternut, on line of Wisconsin Central Railroad, to Butternut Lake | 6 |
| Fifield, on line of Wisconsin Central Railroad, to Round Lake | 17 |
| Round Lake to Squaw Lake | 6 |
| Squaw Lake to Bear Creek | 12 |
| Bear Creek to Park Lake | 9 |
| Bear Creek to Rest Lake | 9 |
| Chippewa Falls to Paint Creek | 4 |
| Total | 119 |

## APPENDIX *t*.

### TABLE IX.—CHIPPEWA RIVER.

*List of lands and approximate areas which will be overflowed by proposed reservoirs on the Chippewa River and tributaries.*

#### BEAR LAKE RESERVOIR.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | *Township* 41 *north, range* 3 *west.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 16 | SW. ¼ of SE. ¼ | | 40.00 | | | | |
| 16 | S. ½ of SW. ¼ | | 80.00 | | | | |
| 19 | NW. ¼ of SE. ¼ | 40.00 | | | | | |
| 19 | S. ½ of SE. ¼ and SE. ¼ of SW. ¼ | 120.00 | | | | | |
| 20 | E. ½ of NE. ¼ | 80.00 | | | | | |
| 20 | SW. ¼ of NE. ¼ | | | 40.00 | | | |
| 20 | SE. ¼ | 160.00 | | | | | |
| 20 | E. ½ of SW. ¼ | | | 80.00 | | | |
| 20 | SW. ¼ of SW. ¼ | | | 40.00 | | | |
| 21 | NW. ¼ of NE. ¼ | | | 40.00 | | | |
| 21 | NW. ¼ and NW. ¼ of SW. ¼ | 200.00 | | | | | |
| 21 | NE. ¼ of SW. ¼ and SW. ¼ of SW. ¼ | | | 80.00 | | | |
| 21 | SE. ¼ of SE. ¼ | | | 40.00 | | | |
| *22 | S. ½ of NE. ¼ | | | 80.00 | | | |
| *22 | N. ½ of SE. ¼ and SW. ¼ of SE. ¼ | | | 120.00 | | | |
| *22 | S. ½ of SW. ¼ and NE. ¼ of SW. ¼ | | | 120.00 | | | |
| 27 | NW. ¼ of NW. ¼ | | | 40.00 | | | |
| *28 | NE. ¼ of NE. ¼ and W. ½ of NE. ¼ | | | 120.00 | | | |
| *28 | SE. ¼ of NW. ¼ and SW. ¼ | | | 200.00 | | | |
| 29 | N. ½ of NE. ¼ and SW. ¼ of NE. ¼ | | | 120.00 | | | |
| *29 | SE. ¼ of SE. ¼ and W. ½ | | | 360.00 | | | |
| *30 | S. ½ and E. ½ of NE. ¼ | | | 400.00 | | | |
| 30 | SW. ¼ of NE. ¼ and SE. ¼ of NW. ¼ | | | 80.00 | | | |
| 30 | NW. ¼ of NE. ¼ and NE. ¼ of NW. ¼ | 80.00 | | | | | |
| 31 | N. ½ of NE. ¼ and SW. ¼ of NE. ¼ | | | 120.00 | | | |
| *31 | SE. ¼ of SE. ¼ and NW. ¼ | | | 200.00 | | | |
| *31 | W. ½ of SW. ¼ | | | 80.00 | | | |
| *32 | N. ½ and SW. ¼ | | | 480.00 | | | |
| *33 | NW. ¼ of NW. ¼ | | | 40.00 | | | |
| | *Township* 41 *north, range* 4 *west.* | | | | | | |
| *25 | S. ½ of section | | | 320.00 | | | |
| 25 | SW. ¼ of NW. ¼ | 40.00 | | | | | |
| *26 | SE. ¼ of section | | | 160.00 | | | |
| 35 | E. ½ and E. ½ of SW. ¼ | | | 400.00 | | | |
| *36 | | | | 470.00 | | | |
| | Total | 720.00 | 120.00 | 4,230.00 | | | |

* Acreage approximate.

#### LITTLE CHIEF LAKE.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Township* 40 *north, range* 5 *west.* | | | | | | |
| 23 | Lots 4 and 5 | | | 86.94 | | | |
| 21 | Lots 1, 2, and 3 | | | 111.60 | | | |
| 22 | Lots 2, 3, 4, 5, 6, 7, 8, and 9 | | | 283.40 | | | |
| 27 | Lot 1 | | | 35.64 | | | |
| 28 | Lots 1, 2, 3, 4, 5, and 6 | | | 318.55 | | | |
| 29 | Lots 1, 2, 3, 4, and 5 | | | 226.85 | | | |
| 29 | NW. ¼ | | | 160.00 | | | |
| 30 | Lot 1 and NE. ¼ of SE. ¼ | | | 76.98 | | | |
| 30 | W. ½ of SE. ¼ | | | 80.00 | | | |
| 30 | E. ½ of SW. ¼ and SW. ¼ of SW. ¼ | | | 122.21 | | | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

LITTLE CHIEF LAKE—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | *Township* 40 *north, range* 5 *west*—Continued. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 31 | Lots 1, 2, 5, 6, and 7 | | | 233.01 | | | |
| 32 | Lots 1, 2, and 3 | | | 118.73 | | | |
| 32 | NE. ¼ of NE. ¼ and S. ½ of NE. ¼ | | | 120.00 | | | |
| 33 | S. ½ of NW. ¼ and SW. ¼ of NE. ¼ | | | 120.00 | | | |
| | *Township* 40 *north, range* 6 *west.* | | | | | | |
| 25 | NW. ¼ of SE. ¼ and S. ½ of SE. ¼ | | | 120.00 | | | |
| 25 | SW. ¼ | | | 160.00 | | | |
| 26 | E. ½ of SE. ¼ and NW. ¼ of SE. ¼ and N. ½ of SW. ¼ | | | 200.00 | | | |
| 36 | N. ½ of NE. ¼ and NE. ¼ of NW. ¼ | | | 120.00 | | | |
| | Total | | | 2,693.91 | | | |

MOOSE LAKE.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Township* 41 *north, range* 5 *west.* | | | | | | |
| 4 | SE. ¼ of SE. ¼ | | | 40.00 | | | |
| *6 | W. ½ of W. ½ and SE. ¼ of NW. ¼ | | | 200.00 | | | |
| *6 | NE. ¼ of NW. ¼ | | | | | 40.00 | |
| 6 | E. ½ of SW. ¼ | | | 80.00 | | | |
| *7 | W. ½ of W. ½ and NE. ¼ of NW. ¼ | | | | 200.00 | | |
| 9 | N. ½ of NE. ¼ and SW. ¼ of NE. ¼ | | | | 120.00 | | |
| 9 | W. ½ of SE. ¼ and SE. ¼ of NW. ¼ | | | | 120.00 | | |
| 9 | E. ½ of SW. ¼ and SW. ¼ of SW. ¼ | | | | 120.00 | | |
| 8 | S. ½ of SE. ¼ | | | 80.00 | | | |
| 16 | NW. ¼ of NE. ¼ and NW. ¼ | | 200.00 | | | | |
| 17 | E. ½ and E. ½ of NW. ¼ | | | | 400.00 | | |
| 17 | SW. ¼ of NW. ¼ and NE. ¼ of SW. ¼ | | | | 80.00 | | |
| 17 | S. ½ of SW. ¼ and NW. ¼ of SW. ¼ | 120.00 | | | | | |
| 18 | SE. ¼ of NE. ¼ and W. ½ of SE. ¼ | | | 120.00 | | | |
| 18 | E. ½ of SE. ¼ | 80.00 | | | | | |
| *18 | W. ½ of NW. ¼ and NW. ¼ of SW. ¼ | | | 120.00 | | | |
| 19 | E. ½ and SE. ¼ of SW. ¼ | 360.00 | | | | | |
| 19 | SE. ¼ of NW. ¼ and NE. ¼ of SW. ¼ | | | | 80.00 | | |
| *19 | W. ½ of SW. ¼ | | | | 80.00 | | |
| 20 | N. ½ of NE. ¼ and SW. ¼ of NE. ¼ | | | 120.00 | | | |
| 20 | SE. ¼ of SE. ¼ and W. ½ of SE. ¼ | | | 120.00 | | | |
| 20 | E. ½ of SW. ¼ and SW. ¼ of SW. ¼ | | | 120.00 | | | |
| 20 | SE. ¼ of NW. ¼ | | | | | 40.00 | |
| 20 | N. ½ of NW. ¼ and SW. ¼ of NW. ¼ | 120.00 | | | | | |
| 20 | NW. ¼ of SW. ¼ | 40.00 | | | | | |
| 21 | SW. ¼ of SW. ¼ | | | | 40.00 | | |
| 28 | NW. ¼ of NW. ¼ | | | 40.00 | | | |
| 29 | N. ½ of N. ½ and SW. ¼ of NW. ¼ | | | | 200.00 | | |
| 30 | E. ½ of NE. ¼ and NW. ¼ of SE. ¼ | | | 120.00 | | | |
| 30 | W. ½ of NE. ¼ | 80.00 | | | | | |
| *30 | NW. ¼ and N. ½ of SW. ¼ | | | 240.00 | | | |
| | *Township* 41 *north, range* 6 *west.* | | | | | | |
| 11 | SE. ¼ of SE. ¼ | 40.00 | | | | | |
| 12 | SE. ¼ of NE. ¼ and NE. ¼ of SE. ¼ | | | 80.00 | | | |
| 13 | S. ½ of N. ½ and N. ½ of S. ½ | | | | | 320.00 | |
| 13 | S. ½ of SW. ¼ | | | | | 80.00 | |
| 14 | E. ½ of E. ½ and SW. ¼ of NE. ¼ | | | 200.00 | | | |
| 14 | SW. ¼ of SE. ¼ | | | 40.00 | | | |
| 23 | NE. ¼ | | | | | 160.00 | |
| 24 | W. ½ of NE. ¼ and NW. ¼ | | | 240.00 | | | |
| 24 | SE. ¼ and NE. ¼ of SW. ¼ | | | 200.00 | | | |
| 25 | NE. ¼ | | | | | 160.00 | |

*Acreage approximate.

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

MOOSE LAKE—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| | *Township 42 north, range 5 west.* | | | | | | |
| 31 | E. ½ of SE. ¼ and SW. ¼ of SE. ¼ | 120.00 | | | | | |
| 31 | SE. ¼ of SW. ¼ | 40.00 | | | | | |
| *31 | W. ½ of SW. ¼ and NE. ¼ of SW. ¼ | | | | | 120.00 | |
| 32 | S. ½ of S. ½ and NW. ¼ of SW. ¼ | | | 200.00 | | | |
| 32 | N. ½ of SE. ¼ and SE. ¼ of NE. ¼ | | | 120.00 | | | |
| 32 | NE. ¼ of NE. ¼ | | | 40.00 | | | |
| 33 | NW. ¼ of NW. ¼ | | | | | 40.00 | |
| | Total | 1,000.00 | 200.00 | 2,520.00 | 1,440.00 | 960.00 | |

*Acreage approximate.

PA-KWA-WANG RESERVOIR.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Township 39 north, range 6 west.* | | | | | | |
| 4 | NW. ¼ of NE. ¼ | | | 37.92 | | | |
| 6 | NW. ¼ of NW. ¼ | | | | | 34.61 | |
| | *Township 39 north, range 7 west.* | | | | | | |
| 1 | N. ½ of NE. ¼ | | | | | | 71.37 |
| 2 | NW. ¼ | | | | | | 161.15 |
| 3 | NE. ¼ and NW. ¼ of SE. ¼ | | | | | | 200.66 |
| 3 | E. ½ of NW. ¼ | | | 80.17 | | | |
| 3 | NE. ¼ of SW. ¼ | | | 40.00 | | | |
| 3 | W. ½ of W. ½ | | | 159.94 | | | |
| 6 | Lots 1, 2, and 3 | | | | | | 113.40 |
| 6 | E. ½ of SW. ¼ | | | | | | 80.00 |
| 6 | W. ½ of SW. ¼ | | | 66.44 | | | |
| 7 | NE. ¼ of NW. ¼ | | | | | | 40.00 |
| 7 | W. ½ of NW. ¼ | | | | | | 67.14 |
| 9 | SE. ¼ of NE. ¼ | | | 40.00 | | | |
| 9 | NE. ¼ of NE. ¼ | | | | | | 40.00 |
| 9 | SW. ¼ of SE. ¼ | | | 40.00 | | | |
| 9 | Lots 4 and 5 | | | | | | 130.20 |
| 10 | N. ½ of NE. ¼ | | | | | | 80.00 |
| 10 | NW. ¼ of NW. ¼ | | | 40.00 | | | |
| 10 | NE. ¼ of NW. ¼ | | | | | | 40.00 |
| | *Township 39 north, range 8 west.* | | | | | | |
| 1 | Lots 1, 2, and 3 | | | | | | 99.60 |
| 1 | SE. ¼ of SE. ¼ | | | | | | 40.00 |
| 12 | NE. ¼ | | | | | | 160.00 |
| | *Township 40 north, range 6 west.* | | | | | | |
| 5 | W. ½ of SW. ¼ | | | | 80.00 | | |
| 6 | SE. ¼ of SW. ¼ | | | 40.00 | | | |
| 6 | W. ½ of SW. ¼ | | | | | 65.90 | |
| 7 | All of section, except SE. ¼ of SE. ¼ | | | | 579.52 | | |
| 8 | W. ½ of NW. ¼ | | | 80.00 | | | |
| 8 | E. ½ of SE. ¼ | | | | | | 80.00 |
| 8 | SW. ¼ of SE. ¼ | | | 40.00 | | | |
| 9 | S. ½ of N. ½ | | | | | | 160.00 |
| 9 | NW. ¼ of SW. ¼ | | | | | | 40.00 |
| 9 | NE. ¼ of SW. ¼ and N. ½ of SE. ¼ | | | | | | 120.00 |
| 10 | SW. ¼ of NW. ¼ | | | | | | 40.00 |
| 16 | S. ½ of NW. ¼ | | 80.00 | | | | |
| 16 | N. ½ of SW. ¼ | | 80.00 | | | | |
| 16 | SE. ¼ of SW. ¼ | | 40.00 | | | | |
| 16 | SW. ¼ of SW. ¼ | | | | | | 40.00 |
| 17 | SE. ¼ of NE. ¼ | | | | | | 40.00 |

*List of lands and approximate areas which will be overflowed*—Continued.

PA-KWA-WANG RESERVOIR—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | *Township* 40 *north, range* 6 *west*—Continued. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 17 | W. ½ of NE. ¼ | | | | 80.00 | | |
| 17 | E. ½ of NW. ¼ | | | | 80.00 | | |
| 17 | E. ½ of SE. ¼ | | | | | | 80.00 |
| 17 | W. ½ of SE. ¼ | | | | 80.00 | | |
| 17 | W. ½ of SW. ¼ | | | | 80.00 | | |
| 18 | SE. ¼ of NE. ¼ and W. ½ of NE. ¼ | | | 120.00 | | | |
| 18 | NW. ¼ and N. ½ of SW. ¼ | | | 228.33 | | | |
| 18 | SE. ¼ of SW. ¼ | | | | | 40.00 | |
| 18 | SW. ¼ of SW. ¼ | | | 36.53 | | | |
| 19 | NE. ¼ | | | | | | 160.00 |
| 19 | NW. ¼ and S. ½ | | | | 471.94 | | |
| 20 | All of section | | | | | | 579.68 |
| 21 | S. ½ of NE. ¼ | | | | 80.00 | | |
| 21 | N. ½ of SE. ¼ and SW. ¼ of SE. ¼ | | | | 120.00 | | |
| 21 | NW. ¼ of NW. ¼ | | | | | | 40.00 |
| 21 | SW. ¼ of NW. ¼ and SW. ¼ | | | | 200.00 | | |
| 27 | N. ½ of SE. ¼ and SW. ¼ of SE. ¼ | | | | 120.00 | | |
| 27 | N. ½ of NW. ¼ and SE. ¼ of NW. ¼ | | | | 120.00 | | |
| 27 | Lot 1 | | | | | | 62.36 |
| 27 | S. ½ of SW. ¼ | | | | 80.00 | | |
| 28 | Lots 1, 2, 3, 5, 6, and 7 | | | | | | 243.12 |
| 28 | E. ½ of NE. ¼ and NW. ¼ | | | 239.86 | | | |
| 28 | SE. ¼ of SE. ¼ and NW. ¼ of SE. ¼ | | | 80.00 | | | |
| 29 | | | | | | | 450.77 |
| 30 | NE. ¼ of NE. ¼ | | | 40.00 | | | |
| 30 | S. ½ of NE. ¼ and NW. ¼ of NE. ¼ | | | | | 120.00 | |
| 30 | NW. ¼ | | | | | 159.37 | |
| 30 | Lots 1 and 2 and NE. ¼ of SE. ¼ | | | | | | 121.20 |
| 31 | All of section except SE. ¼ of SE. ¼ | | | | | | 399.03 |
| 32 | N. ½ of NE. ¼ and lots 1 and 2 | | | | | | 190.80 |
| 32 | S. ½ of NE. ¼ and SE. ¼ and N. ½ of SW. ¼ | | | 320.00 | | | |
| 33 | Lots 2, 3, 4, 5, 6, and 7 | | | | | | 562.03 |
| 33 | And E. ½ of NE. ¼ and NW. ¼ of NE. ¼ and SW. ¼ of SW. ¼ | | | | | | 473.39 |
| | *Township* 40 *north, range* 7 *west.* | | | | | | |
| 12 | S. ½ of NE. ¼ | | | 80.00 | | | |
| 12 | W. ½ of NW. ¼ and SE. ¼ of NW. ¼ and S. ½ of section | | | 520.00 | | | |
| 2 | S. ½ of SW. ¼ | | | 80.00 | | | |
| 5 | W. ½ of SW. ¼ | | | | 80.00 | | |
| 6 | NE. ¼ of SE. ¼ | | | 40.00 | | | |
| 6 | SE. ¼ of SE. ¼ | | | | | 40.00 | |
| 7 | Lots 1, 2, 3, and 4 | | | | 167.28 | | |
| 8 | Lot 1 | | | | | 38.85 | |
| 8 | Lots 2, 3, and 4 and SE. ¼ of SW. ¼ | | | 183.30 | | | |
| 11 | E. ½ and E. ½ of NW. ¼ and E. ½ of SW. ¼ and SW. ¼ of SW. ¼ | | | | 520.00 | | |
| 13 | | | | | 640.00 | | |
| 14 | E. ½ and E. ½ of W. ½ | | | | | 480.00 | |
| 14 | SW. ¼ of NW. ¼ and W. ½ of SW. ¼ | | | 120.00 | | | |
| 15 | S. ½ of N. ½ and S ½ | | | | 480.00 | | |
| 16 | E. ½ of SE. ¼ and SW. ¼ of SE. ¼ and SW. ¼ and SW. ¼ of NW. ¼ | | 320.00 | | | | |
| 17 | S. ½ of NE. ¼ and NW. ¼ of NE. ¼ and NE. ¼ of SE. ¼ and S. ½ of SE. ¼ | | | | 240.00 | | |
| 17 | N. ½ of NW. ¼ and SE. ¼ of NE. ¼ | | | | 120.00 | | |
| 19 | SE. ¼ and W. ½ of SW. ¼ | | | | 215.99 | | |
| 20 | N. ½ of NE. ¼ | | | | | 80.00 | |
| 20 | S. ½ of N. ½ and S. ½ | | | 480.00 | | | |
| 21 | | | | | 640.00 | | |
| 22 | | | | 640.00 | | | |
| 23 | W. ½ of NE. ¼ and NW. ¼ and S. ½ of section | | | | 560.00 | | |
| 24 | N. ½ of N. ½ and SE. ¼ of NE. ¼ | | | 200.00 | | | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

PA-KWA-WANG RESERVOIR—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | *Township* 40 *north, range* 7 *west*—Contieued. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 24 | SE. ¼ of NW. ¼ and N. ½ of SW. ¼ | | | 120. 00 | | | |
| 24 | SE. ¼ of SW. ¼ and SW. ¼ of SE. ¼ | | | 80. 00 | | | |
| 24 | SE. ¼ of NE. ¼ and N. ½ of SE. ¼ | | | | | 120. 00 | |
| 24 | SE. ¼ of SE. ¼ and SW. ¼ of SW. ¼ | | | | | 80. 00 | |
| 25 | N. ½ of N. ½ and SW. ¼ of NE. ¼ | | | | 200. 00 | | |
| 25 | S. ½ of NW. ¼ and W. ½ of SW. ¼ | | | | 160. 00 | | |
| 26 | Lots 1, 2, 3, and 4 | | | | | | 240. 27 |
| 26 | NW. ¼ of NW. ¼ | | | | | 40. 00 | |
| 26 | E. ½ of NE. ¼ and NW. ¼ of NE. ¼ | | | 120. 00 | | | |
| 26 | E. ½ of NW. ¼ | | | 80. 00 | | | |
| 27 | Lots 1 and 2 | | | | | | 131. 60 |
| 27 | N. ½ and SW. ¼ | | | | 480. 00 | | |
| 28 | E. ½ and S. ½ of SW. ¼ | | | 400. 00 | | | |
| 28 | E. ½ of NW. ¼ and NW. ¼ of NW. ¼ | | | 120. 00 | | | |
| 28 | SW. ¼ of NW. ¼ and N. ½ of SW. ¼ | | | | | 120. 00 | |
| 29 | All except NW. ¼ of NE. ¼ | | | | 600. 00 | | |
| 30 | NE. ¼ of SE. ¼ and SW. ¼ of SE. ¼ | | | 80. 00 | | | |
| 30 | Lot 2 | | | 44. 75 | | | |
| 30 | Lot 1 | | | 32. 60 | | | |
| 30 | SE. ¼ of SE. ¼ and NW. ¼ of SE. ¼ | | | | | 80. 00 | |
| 30 | NE. ¼ of SW. ¼ | | | | | 40. 00 | |
| 30 | W. ½ of NW. ¼ | | | 58. 34 | | | |
| 31 | Lots 1, 2, 3, 4 | | | 201. 00 | | | |
| 33 | NE. ¼ and E. ½ of NW. ¼ | | | 240. 00 | | | |
| 33 | N. ½ of SE. ¼ and SE. ¼ of SE. ¼ | | | 120. 00 | | | |
| 34 | Lots 1, 2, and 3 | | | | | | 164. 20 |
| 34 | NW. ¼ of NE. ¼ | | | | | | 40. 00 |
| 34 | E. ½ of NW. ¼ and NW. ¼ of NW. ¼ | | | | | 120. 00 | |
| 34 | SW. ¼ of NW. ¼ and SW. ¼ | | | 200. 00 | | | |
| 35 | Lots 1, 2, 3, 4, 5, 6, and 7 | | | | | | 257. 88 |
| 36 | Lots 1, 2, 3, and 4 | | | | | | 138. 15 |
| | *Township* 40 *north, range* 8 *west.* | | | | | | |
| 24 | SW. ¼ of NE. ¼ | | | | | | 40. 00 |
| 24 | SE. ¼ | | | | | | 160. 00 |
| 25 | NE. ¼ and E. ½ of NW. ¼ | | | | | | 240. 00 |
| 25 | S. ½ | | | | | | 319. 99 |
| 35 | S. ½ of NE. ¼ | | | | | | 80. 00 |
| 36 | Lots 1, 2, 3, and 4 | | | | | | 200. 95 |
| 36 | NW. ¼ | | | | | | 160. 00 |
| | Total | | 520. 00 | 5,869.18 | 7,274.73 | 1,658.73 | 7,378.94 |

LAC COURTES OREILLES.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Township* 39 *north, range* 8 *west.* | | | | | | |
| 5 | Lots 4 and 5 | | | | | | 93. 60 |
| 6 | Lots 1 and 4 | | | | | | 67. 37 |
| 7 | Lots 1 and 2 | | | | | | 81. 50 |
| | *Township* 39 *north, range* 9 *west.* | | | | | | |
| 1 | Lots 1, 2, and 3 | | | | | | 95. 80 |
| 2 | Lots 1 and 2 | | | | | 95. 10 | |
| 3 | Lots 1, 2, and 3 | | | | 143. 45 | | |
| 4 | Lots 2, 3, and 4 | | | 157. 99 | | | |
| 4 | Lot 1 | | | | | 36. 15 | |
| 9 | Lots 1, 2, and 3 | | | | 183. 48 | | |
| 10 | Lots 1, 5, and 6 | | | 115. 25 | | | |
| 10 | Lots 2, 3, and 4 | | | | | 83. 13 | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

LAC COURTES OREILLES—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | *Township* 39 *north, range* 9 *west*—Continued. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 11 | Lots 1, 2, 3, 4, 5, 6, and 7 | | | | 266.06 | | |
| *12 | Lots 1, 2, 3, 4, 5, 6, 7, and 8 | | | | | | 301.31 |
| 13 | Lots 1, 2, and 3 | | | | | | 134.20 |
| 14 | Lots 1, 2, 3, and 4 | | | 201.23 | | | |
| 14 | NW. ¼ of NW. ¼ | | | 40.00 | | | |
| 15 | N. ½ and lot 1 | | | | 351.25 | | |
| 16 | E. ½ of NE. ¼ | | 80.00 | | | | |
| 16 | Lots 1, 2, 3, and 4 | | 206.75 | | | | |
| 17 | Lots 1, 2, and 3 | | | | 159.40 | | |
| 19 | Lots 1, 2, and 3 | | | | 110.30 | | |
| *20 | Lots 1, 2, 3, 4, 5, 6, 7, and 8 | | | | | 369.30 | |
| 21 | Lots 1, 2, 3, 4, 5, and 6 | | | | 145.00 | | |
| 15 | N. ½ of SE. ¼ and SW. ¼ of SE. ¼ | | | | 120.00 | | |
| 15 | SE. ¼ of SW. ¼ | | | | 40.00 | | |
| 22 | Lots 1, 2, 4, 7, and 8 | | | | | 246.82 | |
| 22 | Lots 3, 5, and 6 | | | 127.98 | | | |
| 22 | NE. ¼ of NW. ¼ | | | 40.00 | | | |
| 22 | N. ½ of SE. ¼ | | | | | 80.00 | |
| 23 | Lots 1, 2, and 3 | | | | 83.53 | | |
| 27 | Lots 1 and 2 | | | | 78.95 | | |
| 27 | NW. ¼ of NW. ¼ | | | | 40.00 | | |
| 29 | NW. ¼ | | | | 160.00 | | |
| 30 | NE. ¼ of NE. ¼ | | | | | 40.00 | |
| 30 | SE. ¼ of NE. ¼ | | | 40.00 | | | |
| | *Township* 40 *north, range* 8 *west.* | | | | | | |
| 7 | Lots 2 and 3 | | | | | | 69.67 |
| 8 | Lots 1 and 2, and W. ½ of NE. ¼ | | | | | | 203.08 |
| 17 | Lots 1, 2, 3, and 4 | | | | | | 205.33 |
| 17 | W. ½ of NE. ¼ | | | | | | 80.00 |
| 18 | Lots 1, 2, 3, and 4 | | | | | | 125.56 |
| 19 | Lot 1 | | | | | | 1.70 |
| 20 | Lots 1, 2, 3, 4, and 5 | | | | | | 165.06 |
| 21 | Lots 1 and 2 | | | | | | 86.25 |
| 21 | SE. ¼ | | | | | | 160.00 |
| 28 | Lots 1, 2, 3, 4, 5, and 6, and NE. ¼ of NE. ¼ | | | | | | 282.55 |
| 29 | Lots 1, 2, 3, 4, 5, 6, 7, and 8 | | | | | | 267.18 |
| 29 | SW. ¼ of NE. ¼ and S. ½ of NW. ¼ | | | | | | 120.00 |
| 30 | Lots 1, 2, 3, and 4 | | | | | | 133.87 |
| 31 | Lots 1, 2, 3, and 4 | | | | | | 165.96 |
| 32 | Lots 1, 2, 3, 4, and 5 | | | | | | 132.64 |
| 33 | Lots 1, 2, 3, and 4 | | | | | | 197.55 |
| | *Township* 40 *north, range* 9 *west.* | | | | | | |
| 13 | Lots 1, 2, 3, 4, and 5 | | | | 147.62 | | |
| 14 | S. ½ of SE. ¼ | | | | | 80.00 | |
| 21 | Lots 1, 2, 3, and 4 | | | | 146.13 | | |
| 22 | Lots 1, 2, 3, 4, and 5 | | | | | 248.22 | |
| 22 | Lots 6, and 7 | | | 25.10 | | | |
| 23 | Lots 1, 2, 3, and 4 | | | | 137.73 | | |
| 23 | SE. ¼ of SW. ¼ | | | | 40.00 | | |
| 24 | Lots 1 and 2 | | | | | | 6.87 |
| 25 | Lots 1, 2, 3, and 4 | | | | 173.16 | | |
| 26 | Lots 2, 3, and 7 | | | 137.40 | | | |
| 26 | Lots 1, 4, 5, and 6 | | | | | 138.27 | |
| 26 | SW. ¼ of SE. ¼ | | | | | 40.00 | |
| *27 | Lots 1, 2, 3, 4, 5, 6, and 7 | | | | 239.75 | | |
| 27 | SW. ¼ of SE. ¼ and SW. ¼ of SW. ¼ | | | | 80.00 | | |
| *28 | Lots 1 and 4 | | | 41.00 | | | |
| 28 | Lots 2, 3, 5, 6, and 7 | | | | | 189.32 | |
| 28 | S. ½ of SE. ¼ | | | | | 80.00 | |

* Acreage approximate.

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

LAC COURTES OREILLES—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | *Township* 40 *north, range* 9 *west*—Continued. | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 33 | Lots 1, 2, 3, and 4 | | | | 193.55 | | |
| 34 | Lots 1, 2, 3, 4, 5, 6, 7, and 8 | | | | | 342.56 | |
| 34 | SE. ¼ of NW. ¼ | | | | | 40.00 | |
| 35 | Lots 1, 2, 3, 4, 5, 6, and 7 | | | | 245.57 | | |
| 35 | NW. ¼ of NE. ¼ | | | | 40.00 | | |
| 35 | NE. ¼ of NW. ¼ | | | | 40.00 | | |
| 36 | Lots 1, 2, 3, 4, 5, and 6 | | | | | | 233.86 |
| | Total | | 286.75 | 925.95 | 3,364.93 | 2,108.87 | 3,410.91 |

PAINT CREEK RESERVOIR.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Township* 28 *north, range* 8 *west.* | | | | | | |
| 2 | SW. ¼ | | | 160.00 | | | |
| 2 | W. ½ of NW. ¼ | | | 77.56 | | | |
| 2 | E. ½ of NW. ¼ | 80.94 | | | | | |
| 3 | Lots 1, 2, 3, 4, 5, 8, and 9 | | | 209.92 | | | |
| 3 | SW. ¼ of SE. ¼ | | | | 40.00 | | |
| 3 | SE. ¼ of SE. ¼ | | | 40.00 | | | |
| 10 | NE. ¼ of NE. ¼ | | | 40.00 | | | |
| 10 | SE. ¼ of NE. ¼ | | | 40.00 | | | |
| 11 | W. ½ of NW. ¼ | | | 80.00 | | | |
| 11 | E. ½ of NW. ¼ | | | 80.00 | | | |
| 11 | S. ½ of NE. ¼ | | | | 80.00 | | |
| | *Township* 29 *north, range* 8 *west.* | | | | | | |
| 22 | Lots 1, 2, 3, 4, 5, 6, 7, and 8 | | | 325.53 | | | |
| 23 | Lots 2, 3, and 4 | | | 128.67 | | | |
| 23 | Lots 1 and 5 | | | | 60.79 | | |
| 25 | SW. ¼ of NW. ¼ and NW. ¼ of SW. ¼ | | | 80.00 | | | |
| 26 | Lots 1, 2, 3, 4, 5, 6, 7, 8, and 9 | | | 343.35 | | | |
| 26 | NE. ¼ of SE. ¼ | | | 40.00 | | | |
| 27 | S. ½ NE. ¼ and SE. ¼ | 240.00 | | | | | |
| 27 | E. ½ of SW. ¼ and SW. ¼ of SW. ¼ | 120.00 | | | | | |
| 34 | All except SW. ¼ of SW. ¼ | | | 572.36 | | | |
| 35 | Lots 1, 2, 3, 4, and 5 | 171.60 | | | | | |
| 35 | SE. ¼ of SW. ¼ | 40.00 | | | | | |
| 35 | Lot 6 | | | 19.17 | | | |
| 35 | Lot 7 | | | | 20.00 | | |
| | Total | 652.54 | | 2,236.56 | 200.79 | | |

BUTTERNUT LAKE.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Township* 40 *north, range* 1 *west.* | | | | | | |
| 4 | Lots 1, 2, 3, 4, and 5 | | | 199.09 | | | |
| 5 | Lots 1, 2, 3, 4, 5, 6, and 7 | | | | 272.21 | | |
| 5 | NW. ¼ of NW. ¼ | | | | 40.81 | | |
| 7 | SE. ¼ of SE. ¼ | 40.00 | | | | | |
| 8 | Lots 1, 2, 3, 4, 7, and 8 | | | 237.07 | | | |
| 8 | Lots 5 and 6 | | | | | 93.10 | |
| 9 | Lot 1 | 39.93 | | | | | |
| 17 | Lots 1, 2, 3, 4, and 5 | | | | 174.72 | | |
| 17 | W. ½ of SE. ¼ and SE. ¼ of SW. ¼ | | | | 120.00 | | |
| 17 | SW. ¼ of SW. ¼ | 40.00 | | | | | |
| 18 | Lots 1, 2, and 3 | | | 131.33 | | | |
| 20 | NW. ¼ of NE. ¼ and NE. ¼ of NW. ¼ | | | 80.00 | | | |
| 20 | NW. ¼ of NW. ¼ | | | | | 40.00 | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

BUTTERNUT LAKE—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | United States and Indian reserve lands. | |
|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | United States. | Indian. |
| | *Township* 41 *north, range* 1 *west.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| 28 | SE. ¼ of SE. ¼ and SW. ¼ of SW. ¼ | 80.00 | | | | | |
| 28 | SW. ¼ of SE. ¼ and SE. ¼ of SW. ¼ | | | | | 80.00 | |
| 28 | W. ½ of NE. ¼ and N. ½ of SE. ¼ | | | 160.00 | | | |
| 28 | NW. ¼ and N. ½ of SW. ¼ | | | 240.00 | | | |
| 29 | SE. ¼ | 160.00 | | | | | |
| *32 | N. ½ of NE. ¼ and SE. ¼ of NE. ¼ | 110.00 | | | | | |
| *32 | SW. ¼ of NE. ¼ and W. ½ of SE. ¼ | | | 105.00 | | | |
| 32 | NE. ¼ of NW. ¼ | | | 40.00 | | | |
| *33 | N. ½ of NW. ¼ | 78.00 | | | | | |
| *33 | W. ½ of NE. ¼ and SE. ¼ of NW. ¼ | | | | | 120.00 | |
| *33 | SW. ¼ | | | 120.00 | | | |
| 32 | SW. ¼ | | | 160.00 | | | |
| | Total | 547.93 | | 1,472.49 | 607.74 | 333.10 | |

* Lot numbers not given and acreage approximate.

PARK LAKE.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *Township* 42 *north, range* 3 *east.* | | | | | | |
| 6 | Lot 1 | 39.60 | | | | | |
| 6 | Lots 2 and 3 | | | | | 102.20 | |
| 6 | W. ½ of SW. ¼ | | | | | 87.80 | |
| 6 | N. ½ of NE. ¼ and SE. ¼ of NE. ¼ | | | 121.88 | | | |
| | *Township* 42 *north, range* 2 *east.* | | | | | | |
| 1 | Lots 1, 2, 3, 4, and 5 | | | | 168.90 | | |
| 1 | NE. ¼ of SW. ¼ | | | | 40.60 | | |
| 1 | SE. ¼ of SW. ¼ | 40.00 | | | | | |
| 1 | S. ½ of SE. ¼ | | | | 80.00 | | |
| 2 | NE. ¼ of NE. ¼ | 42.97 | | | | | |
| | *Township* 43 *north, range* 3 *east.* | | | | | | |
| 23 | Lot 4 and S. ½ of SW. ¼ | | | | | 136.20 | |
| 26 | N. ½ of NW. ¼ | | | | | 80.00 | |
| 27 | N. ½ of NE. ¼ | 80.00 | | | | | |
| 27 | SW. ¼ of NE. ¼ | 40.00 | | | | | |
| 27 | Lots 1, 3, and 4 | | | | | 92.50 | |
| 27 | Lot 2 | 59.30 | | | | | |
| 28 | Lots 2 and 3 | | | | | 87.80 | |
| 28 | Lot 1 | 54.80 | | | | | |
| 28 | NE. ¼ of NE. ¼ | | | | | 40.00 | |
| 28 | SW. ¼ | | | | | 160.00 | |
| 29 | S. ½ of S. ½ | | | | | 160.00 | |
| 29 | W. ½ of NW. ¼ and NW. ¼ of SW. ¼ | | | | | 120.00 | |
| 30 | E. ½ of NE. ¼ | 80.00 | | | | | |
| 30 | SE. ¼ | | | | | 160.00 | |
| 30 | SE. ¼ of SW. ¼ | | | | | 40.00 | |
| 31 | Lots 1, 2, 3, 4, 7, and 8 | | | | | 158.90 | |
| 31 | Lots 5 and 6 | 62.70 | | | | | |
| 31 | NE. ¼ of NE. ¼ | | | | | 40.00 | |
| 31 | NE. ¼ of SE. ¼ and SW. ¼ of SE. ¼ | | | | | 80.00 | |
| 32 | NW. ¼ of NE. ¼ and NW. ¼ | | | | | 200.00 | |
| 33 | N. ½ of N. ½ | | | | | 158.50 | |
| | *Township* 43 *north, range* 2 *east.* | | | | | | |
| 35 | SE. ¼ of SE. ¼ | 40.00 | | | | | |
| 36 | Lots 2 and 3 | 74.80 | | | | | |
| 36 | Lots 1, 4, 5, and 6 | | | | | 163.40 | |
| | Total | 614.17 | | 121.88 | 288.90 | 2,067.30 | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

PARK LAKE—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township 39 north, range 3 east of 4th P. M.* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 1 | Lots 4 and 5 | | | | | | | 50 |
| 2 | Lots 1 and 4 | | | 60 | | | | |
| 3 | NW. ¼ of SE. ¼, SE. ¼ of SE. ¼ | | | 80 | | | | |
| 3 | E. ½ of SW. ¼, SW. ¼ of SE. ¼ | 120 | | | | | | |
| 10 | Entire section, except lot 1 | 600 | | | | | | |
| 11 | Lots 1, 2, and 3 | | | | 130 | | | |
| 11 | S. ½ of NW. ¼, SW. ¼ | 240 | | | | | | |
| 12 | Lot 1, SW. ¼ of NW. ¼ | | | | | | | 75 |
| 14 | W. ½ of NW. ¼, NW. ¼ of SW. ¼ | 120 | | | | | | |
| 14 | NE. ¼ of NW. ¼, SW. ¼ of SW. ¼, NE. ¼ of SW. ¼ | | | 120 | | | | |
| 15 | Entire section, except SW. ¼ of SE. ¼ | 600 | | | | | | |
| 16 | NE. ¼, SE. ¼ of NW. ¼, E. ½ of SW. ¼, SE. ¼ | | 440 | | | | | |
| 21 | N. ½ and SE. ¼ of NE. ¼, NE. ¼ of NW. ¼ | 160 | | | | | | |
| 22 | N. ½ and SW. ¼ of NW. ¼ | 120 | | | | | | |
| | *Township 39 north, range 4 east of 4th P. M.* | | | | | | | |
| 4 | Lots 1, 2, 4, and 5 | | | 180 | | | | |
| 4 | Lot 3 | | | | | | | 35 |
| 6 | NW. ¼, SW. ¼ | | | | | | | 159 |
| 7 | N. ½ of NW. ¼, W. ½, and SE. ¼ of NE. ¼ | | | | | | | 200 |
| 8 | Lot 1 | | | 35 | | | | |
| 8 | Lot 2 | | | | | | | 25 |
| 9 | Lots 1, 2, 3, 4, 5, 6, 7, and 8 | | | | 345 | | | |
| 10 | SW. ¼ of SW. ¼ | | | 40 | | | | |
| 10 | Lot 5 | | | | | | | 35 |
| 14 | W. ½ of SW. ¼ | 80 | | | | | | |
| 15 | Entire section, except NE. ¼ | 480 | | | | | | |
| 16 | Entire section | | 425 | | | | | |
| 17 | Lot 1, NE. ¼ of SE. ¼, SW. ¼ of SE. ¼ | | | | 110 | | | |
| 17 | SE. ¼ of SE. ¼ | | | | | | | 40 |
| 20 | NE. ¼, E. ½ of NW. ¼, NE. ¼ of SW. ¼, SE. ¼ | 440 | | | | | | |
| 21 | NE. ¼, NW. ¼, N. ½ of SW. ¼ | 400 | | | | | | |
| 22 | NW. ¼ of NE. ¼, NW. ¼, N. ½ of SW. ¼ | 280 | | | | | | |
| | *Township 40 north, range 3 east of 4th P. M.* | | | | | | | |
| 13 | SW. ¼ of SW. ¼ | | | 40 | | | | |
| 14 | S. ½ of SE. ¼ | | | 80 | | | | |
| 23 | Lot 1 | | | | 22 | | | |
| 23 | Lots 2, 3, 4, NE. ¼ of NW. ¼, SW. ¼ of NW. ¼, NW. ¼ of SW. ¼ | | | 235 | | | | |
| 24 | Lot 1, fraction east of lake in SE. ¼ of SE. ¼ | | | | | | | 40 |
| 24 | Lots 2, 4 | | | 120 | | | | |
| 24 | Lots 3, 5, 6, 7 | 155 | | | | | | |
| 25 | NE. ¼ and S. ½ of NE. ¼, NW. ¼ of SE. ¼; lots 1, 3, 4 | | | 250 | | | | |
| 25 | NW. ¼ of NE. ¼, E. ½ of NW. ¼ | 120 | | | | | | |
| 25 | NE. ¼ of SW. ¼ | | | | 40 | | | |
| 25 | Lot 2 | | | | | | | 55 |
| 26 | Lots 1, 2, 6 | 130 | | | | | | |
| 26 | Lots 3, 4, 5, 7, 8, SW. ¼ of SW. ¼ | | | 235 | | | | |
| 27 | NE. ¼ of SW. ¼ | | | | 40 | | | |
| 27 | SW. ¼ of NE. ¼, SE. ¼ of NW. ¼ | | | 80 | | | | |
| 27 | S. ½ of SW. ¼, SE. ¼ | 240 | | | | | | |
| 34 | NE. ¼ | | | 160 | | | | |
| 34 | N. ½ of NW. ¼ | 80 | | | | | | |
| 35 | Lots 1, 2 | | | | 90 | | | |
| 35 | Lots 3, 4 | | | 85 | | | | |
| 36 | Lots 2, 3, 4, 5, 6, E. ½ of SW. ¼, SW. ¼ of SE. ¼ | | | 290 | | | | |
| 36 | Lot 1 | | | | | | | 25 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township 40 north, range 4 east of 4th P. M.* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 1 | Entire section | ..... | ..... | ..... | ..... | ..... | 250 | ..... |
| 2 | Lots 1, 2, 3, 4, 5, 6, 7 | ..... | ..... | ..... | ..... | ..... | 285 | ..... |
| 11 | Lot 2, SE. ¼ of NE. ¼, SE. ¼ | ..... | ..... | ..... | ..... | ..... | 235 | ..... |
| 12 | Entire section | ..... | ..... | ..... | ..... | ..... | 355 | ..... |
| 13 | NE. ¼ | ..... | ..... | ..... | ..... | ..... | 95 | ..... |
| 17 | S. ½ | ..... | ..... | ..... | 320 | ..... | ..... | ..... |
| 18 | NE. ¼, E. ½ of SE. ¼ | ..... | ..... | 240 | ..... | ..... | ..... | ..... |
| 19 | Lots 1, 2, 3, 4 | ..... | ..... | 130 | ..... | ..... | ..... | ..... |
| 19 | Lots 6, 8, 9, SE. ¼ of SE. ¼ | ..... | ..... | ..... | 115 | ..... | ..... | ..... |
| 19 | Lot 7 | 25 | ..... | ..... | ..... | ..... | ..... | ..... |
| 20 | NW. ¼ of NW. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 20 | E. ½ and SW. ¼ of NW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 27 | NW. ¼, N. ½ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | 240 | ..... |
| 28 | E. ½ of NE. ¼ | 80 | ..... | ..... | ..... | ..... | ..... | ..... |
| 28 | W. ½ of NE. ¼, S. ½ of NW. ¼, SW. ¼, N. ½ of SE. ¼ | ..... | ..... | 400 | ..... | ..... | ..... | ..... |
| 29 | N. ½ of NW. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| 30 | N. ½ of NE. ¼, NE. ¼ of NW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 30 | S. ½ of NE. ¼, N. ½ and SW. ¼ of SE. ¼ | 200 | ..... | ..... | ..... | ..... | ..... | ..... |
| 31 | NE. ¼, NW. ¼, SW. ¼, W. ½ of SE. ¼ | ..... | ..... | ..... | 560 | ..... | ..... | ..... |
| 33 | Lots 1, 2, 3, 4, 5, 6, 7, N. ½ and SW. ¼ of NW. ¼ | ..... | ..... | ..... | 385 | ..... | ..... | ..... |
| | *Township 40 north, range 5 east of 4th P. M.* | | | | | | | |
| 2 | Lots 1, 2, 3, E. ½ and NW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 250 |
| 3 | Lots 1, 2 | ..... | ..... | ..... | ..... | ..... | ..... | 95 |
| 5 | Lots 1, 2, 3, 4 | ..... | ..... | ..... | 130 | ..... | ..... | ..... |
| 6 | Entire section | ..... | ..... | ..... | ..... | ..... | ..... | 325 |
| 7 | ..... do | ..... | ..... | ..... | 190 | ..... | ..... | ..... |
| 8 | ..... do | ..... | ..... | ..... | ..... | ..... | ..... | 315 |
| 9 | E. ½ of NE. ¼, W. ½ of NW. ¼, NW. ¼ of SW. ¼, E. ½ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 215 |
| 10 | Lots 1, 2 (entire section) | ..... | ..... | ..... | ..... | ..... | ..... | 95 |
| 11 | Lots 1, 2, 3, 4 (entire section) | ..... | ..... | ..... | ..... | ..... | ..... | 185 |
| 12 | SW. ¼ of SW. ¼, lot 5 | ..... | ..... | ..... | ..... | ..... | ..... | 65 |
| 14 | Lots 1, 2, 3, 4 (entire section) | ..... | ..... | ..... | ..... | ..... | ..... | 145 |
| 15 | Lot 1 (entire section) | ..... | ..... | ..... | ..... | ..... | ..... | 20 |
| 16 | Lots 1, 2, 3, 4, 5, 6, NW. ¼ of NW. ¼ | ..... | 315 | ..... | ..... | ..... | ..... | ..... |
| 17 | Lots 1, 2, 3, 4, 5, 6 (entire section) | ..... | ..... | ..... | 215 | ..... | ..... | ..... |
| 18 | Lots 1, 2, 3, 4, 5, 6, 7 | ..... | ..... | ..... | ..... | ..... | ..... | 240 |
| 19 | Lots 1, 2, 3, 4 | ..... | ..... | ..... | 150 | ..... | ..... | ..... |
| 20 | Lots 1, 2, 3, 4 (entire section) | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| 21 | Lots 1, 2, 3, 4 | ..... | ..... | ..... | ..... | ..... | ..... | 150 |
| 22 | Lots 1, 2, 3, 4, 5 | ..... | ..... | ..... | ..... | ..... | ..... | 160 |
| 23 | Lots 1, 2, 3 (entire section) | ..... | ..... | ..... | ..... | ..... | ..... | 120 |
| 24 | Lots 1, 2, 3, 4 | ..... | ..... | ..... | ..... | ..... | ..... | 155 |
| 26 | Lots 1, 2, 3, NE. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 135 |
| 28 | Lots 1, 2, 3, 4, SE ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 185 |
| 29 | Lots 1, 2, 3, 4, 5 | ..... | ..... | ..... | 175 | ..... | ..... | ..... |
| 30 | Lot 1 | ..... | ..... | ..... | ..... | ..... | ..... | 35 |
| | *Township 41 north, range 4 east of P. M.* | | | | | | | |
| 1 | Entire section | ..... | ..... | ..... | ..... | ..... | 650 | ..... |
| 2 | ..... do | ..... | ..... | ..... | ..... | ..... | 640 | ..... |
| 3 | ..... do | ..... | ..... | ..... | ..... | ..... | 625 | ..... |
| 4 | NE. ¼, SE. ¼, E. ½ of SW. ¼, N. ½ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | 480 | ..... |
| 5 | NE. ¼ of NE. ¼, NE. ¼ of NW. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| 5 | W. ½ of NW. ¼ | ..... | ..... | ..... | 80 | ..... | ..... | ..... |
| 9 | SE. ¼, SW. ¼, E. ½ of NW. ¼, S. ½ and NW ¼ of NE. ¼ | 520 | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | NE. ¼ of NE. ¼ | ..... | ..... | ..... | 40 | ..... | ..... | ..... |
| 10 | NW. ¼, NE. ¼, SE. ¼ | ..... | ..... | ..... | ..... | ..... | 480 | ..... |
| 11 | Entire section | ..... | ..... | ..... | ..... | ..... | 640 | ..... |
| 12 | ..... do | ..... | ..... | ..... | ..... | ..... | 640 | ..... |
| 13 | N. ½ and SW. ¼ of NW. ¼, NW. ¼ of NE. ¼, lots 1, 2 | ..... | ..... | ..... | ..... | ..... | 178 | ..... |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township* 41 *north, range* 4 *east of P. M.*—Cont'd. | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 14 | E. ½ of NE. ¼, W. ½ and NE. ¼ of NW. ¼, W. ½ and SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 315 | ..... |
| 15 | S. ½, W. ½ and NE. ¼ of NW. ¼, SE. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | 445 | ..... |
| 16 | Entire section | ..... | 640 | ..... | ..... | ..... | ..... | ..... |
| 17 | E. ½ | 320 | ..... | ..... | ..... | ..... | ..... | ..... |
| 20 | E. ½ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 80 |
| 20 | E. ½ of SE. ¼ | 80 | ..... | ..... | ..... | ..... | ..... | ..... |
| 21 | Entire section | ..... | ..... | ..... | ..... | ..... | 640 | ..... |
| 22 | SW. ¼, W. ½ of NW. ¼, NE. ¼ of NW. ¼, N. ½ of NE. ¼, E. ½ and SW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 400 | ..... |
| 23 | S. ½, NW. ¼, S. ½ NE. ¼, NE. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | 590 | ..... |
| 24 | N. ½, SW. ¼, W. ½ and NE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 535 | ..... |
| 25 | NW. ¼, SW. ¼, W. ½ of NE. ¼, W. ½ and SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 520 | ..... |
| 26 | N. ½ | ..... | ..... | ..... | ..... | ..... | 315 | ..... |
| 27 | N. ½ | ..... | ..... | ..... | ..... | ..... | 320 | ..... |
| 28 | NE. ¼, E½ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | 400 | ..... |
| 35 | NE. ¼ | ..... | ..... | ..... | ..... | ..... | 160 | ..... |
| 36 | N. ½ of NW. ¼, SW. ¼ of NW. ¼, NE. ¼, N. ½ and SW. ¼ of SE. ¼, SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 440 | ..... |
| | *Township* 41 *north, range* 5 *east of 4th P. M.* | | | | | | | |
| 1 | NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 107 |
| 5 | E. ½ of SW. ¼, lots 1, 2 | 145 | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | Lots 1, 2, 3, SW. ¼ | 240 | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | SW. ¼ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 7 | NW. ¼, N. ½ and SW. ¼ of NE. ¼, N. ½ and SE. ¼ of SW. ¼, W. ½ of SE. ¼ | 480 | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | SE. ¼ of SE. ¼ | ..... | ..... | ..... | 35 | ..... | ..... | ..... |
| 8 | Lot 1 | ..... | ..... | ..... | ..... | ..... | ..... | 30 |
| 8 | NW. ¼ of SW. ¼, lot 2 | 60 | ..... | ..... | ..... | ..... | ..... | ..... |
| 16 | Lots 1, 2, 3 | ..... | 95 | ..... | ..... | ..... | ..... | ..... |
| 17 | 2, 3, 4, 6, 7, 8, 9 (lots) | ..... | ..... | ..... | 205 | ..... | ..... | ..... |
| 17 | Lots 1, 4 | ..... | ..... | ..... | ..... | ..... | ..... | 35 |
| 18 | Lots 1, 2, 3, 4, 5, 6, 7, 8, 9 | ..... | ..... | ..... | ..... | ..... | ..... | 259 |
| 19 | Lots 1, 2 | ..... | ..... | ..... | 73 | ..... | ..... | ..... |
| 20 | Lots 1, 2, 3, 4, E. ½ of SW. ¼, W. ½ of SE. ¼, SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 323 |
| 21 | Lots 1, 2, 3, 4 | ..... | ..... | ..... | 127 | ..... | ..... | ..... |
| 27 | SW. ¼ of NW. ¼, NW. ¼ of SW. ¼ | ..... | ..... | ..... | 75 | ..... | ..... | ..... |
| 28 | Lots 1, 2, 3, 4, 5, 6, 7 | ..... | ..... | ..... | ..... | ..... | ..... | 155 |
| 29 | Lot 1, NW. ¼ of NE. ¼ | 71 | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | Lots 2, 3, 4, NE. ¼ of NW. ¼ | ..... | ..... | ..... | 150 | ..... | ..... | ..... |
| 32 | Lots 1, 2, 3, 4, 5, 6 | ..... | ..... | ..... | ..... | ..... | ..... | 192 |
| 33 | Lots 1, 2, 3 | ..... | ..... | ..... | ..... | ..... | ..... | 80 |
| 33 | Lots 4, 5 | ..... | ..... | ..... | 80 | ..... | ..... | ..... |
| | *Township* 41 *north, range* 6 *east of 4th P. M.* | | | | | | | |
| 5 | SW. ¼, SW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 189 | ..... |
| 6 | E. ½ of NE. ¼, N. ½ of SE. ¼, N. ½ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | 254 | ..... |
| 8 | E. ½ of NW. ¼, NW. ¼ of NE. ¼, E. ½ of SW. ¼, NW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 210 | ..... |
| 15 | S. ½ of SW. ¼, SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 108 |
| 15 | SW. ¼ of SE. ¼ | ..... | ..... | 36 | ..... | ..... | ..... | ..... |
| 16 | SE. ¼ of SE. ¼ | ..... | 40 | ..... | ..... | ..... | ..... | ..... |
| 17 | SE. ¼, W. ½ of NE. ¼, E. ½ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | 300 | ..... |
| 20 | E. ½ of NW. ¼, NE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | 110 | ..... |
| 21 | NW. ¼, W. ½ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 215 |
| 21 | E. ½ of NE. ¼ | ..... | ..... | 74 | ..... | ..... | ..... | ..... |
| 22 | NW. ¼ of NE. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 22 | N. ½ and SE. ¼ of NW. ¼ | ..... | ..... | 115 | ..... | ..... | ..... | ..... |
| | *Township* 42 *north, range* 4 *east of 4th P. M.* | | | | | | | |
| 3 | NW. ¼ of SE. ¼, SW. ¼ of SW. ¼, lot 2 | 138 | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | Lot 1 | ..... | ..... | ..... | 26 | ..... | ..... | ..... |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township 42 north, range 4 east of 4th P. M.*—Cont'd. | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 5 | SW. ¼ of S. W. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 6 | SE. ¼ of SE. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | NE. ¼, SE. ¼, SE. ¼ of NW. ¼, E. ½ of SW. ¼ | 435 | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | S. ½, NW. ¼, S. ½ of NE. ¼ | 545 | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | S. ½, NE. ¼, S. ½ of NW. ¼ | 545 | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | Lots 1, 2, N. ½ of SW. ¼, E. ½ of NE. ¼ | ..... | ..... | 242 | ..... | ..... | ..... | ..... |
| 10 | Lots 3, 4 | 56 | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | NW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 36 |
| 11 | S. ½ of NE. ¼, S. ½ and NW. ¼ of NW. ¼ | ..... | ..... | 185 | ..... | ..... | ..... | ..... |
| 14 | NW. ¼, SW. ¼, W. ½ of NE. ¼, NW. ¼ and SE. ¼ of SE. ¼, lot 1 | 501 | ..... | ..... | ..... | ..... | ..... | ..... |
| 15 | S. ½, NE. ¼, SE. ¼ of NW. ¼ | 520 | ..... | ..... | ..... | ..... | ..... | ..... |
| 15 | SW. ¼ and NE. ¼ of NW. ¼ | ..... | ..... | ..... | 80 | ..... | ..... | ..... |
| 16 | Entire section | ..... | 609 | ..... | ..... | ..... | ..... | ..... |
| 17 | SE. ¼, S. ½ and NE. ¼ of NE. ¼, S. ½ and NE. ¼ of SW. ¼ | 379 | ..... | ..... | ..... | ..... | ..... | ..... |
| 17 | NW. ¼, NW. ¼ of NE. ¼, NW. ¼ of SW. ¼ | ..... | ..... | ..... | 240 | ..... | ..... | ..... |
| 18 | Entire section | 622 | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | NW. ¼, NE. ¼, SW. ¼, NW. ¼ of SE. ¼ | 517 | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | S. ½ and NE. ¼ of SE. ¼ | ..... | ..... | ..... | 120 | ..... | ..... | ..... |
| 20 | N. ½, SE. ¼, N. ½ and SE. ¼ of SW. ¼ | 580 | ..... | ..... | ..... | ..... | ..... | ..... |
| 20 | SW. ¼ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 21 | Entire section | 630 | ..... | ..... | ..... | ..... | ..... | ..... |
| 22 | Entire section | 471 | ..... | ..... | ..... | ..... | ..... | ..... |
| 23 | Lot 2 | ..... | ..... | ..... | ..... | ..... | ..... | 46 |
| 23 | Lot 6, NW. ¼ of NW. ¼ | 88 | ..... | ..... | ..... | ..... | ..... | ..... |
| 23 | Lot 4, E. ½ of SW. ¼ | ..... | ..... | 139 | ..... | ..... | ..... | ..... |
| 23 | Lots 1, 3, 5, S. ½ of SE. ¼ | ..... | ..... | ..... | 210 | ..... | ..... | ..... |
| 24 | NW. ¼ | 160 | ..... | ..... | ..... | ..... | ..... | ..... |
| 25 | E. ½ of SW. ¼, S. W. ¼ of SW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 25 | NW. ¼ of SE. ¼ | ..... | ..... | ..... | 40 | ..... | ..... | ..... |
| 26 | SW. ¼, W. ½ of NW. ¼, SW. ¼ of SE. ¼ | 280 | ..... | ..... | ..... | ..... | ..... | ..... |
| 26 | E. ½ of NW. ¼, N. ½ and SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 200 |
| 26 | NW. ¼ of NE. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 27 | N. ½, SE. ¼, N. ½ and SE. ¼ of SW. ¼ | 600 | ..... | ..... | ..... | ..... | ..... | ..... |
| 27 | SW. ¼ of SW. ¼ | ..... | ..... | ..... | 40 | ..... | ..... | ..... |
| 28 | N. ½, SW. ¼, N. ½ and SW. ¼ of SE. ¼ | 600 | ..... | ..... | ..... | ..... | ..... | ..... |
| 28 | SE. ¼ of SE. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 29 | S. ½, NE. ¼, S. ½ and NE. ¼ of NW. ¼ | 570 | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | NW. ¼ of NW. ¼ | ..... | ..... | ..... | 40 | ..... | ..... | ..... |
| 30 | NW. ¼, S. ½ of NE. ¼, E. ½ of SE. ¼ | 326 | ..... | ..... | ..... | ..... | ..... | ..... |
| 30 | NW. ¼ of NE. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 30 | NE. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 31 | NE. ¼ of NE. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 32 | N. ½, SE. ¼, N. ½ of SW. ¼ | 545 | ..... | ..... | ..... | ..... | ..... | ..... |
| 32 | S. ½ of SW. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| 33 | S. ½, NW. ¼, S. ½ and NW. ¼ of NE. ¼ | 590 | ..... | ..... | ..... | ..... | ..... | ..... |
| 33 | NE. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 34 | Entire section | 640 | ..... | ..... | ..... | ..... | ..... | ..... |
| 35 | Entire section | 640 | ..... | ..... | ..... | ..... | ..... | ..... |
| 36 | S. ½ of N. ½, SE. ¼, N. ½ and SE. ¼ of SW. ¼ | 310 | ..... | ..... | ..... | ..... | ..... | ..... |
| 36 | N. ½ of N. ½, SW. ¼ of SW. ¼ | ..... | ..... | 129 | ..... | ..... | ..... | ..... |
| | *Township 42 north, range 5 east of P. M.* | | | | | | | |
| 1 | Lots 1, 2 | ..... | ..... | ..... | ..... | ..... | ..... | 44 |
| 1 | Lots 4, 5 | 81 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1 | Lots 3, 6, 7, 8, NE. ¼ of NW. ¼ | ..... | ..... | 166 | ..... | ..... | ..... | ..... |
| 3 | NW. ¼ of NW. ¼, W. ½ of SW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 3 | NE. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 4 | Lots 2, 3, 5, 6, 7, 8, NE. ¼ of NE. ¼ | ..... | ..... | 220 | ..... | ..... | ..... | ..... |
| 4 | Lots 1, 4, NW. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 89 |
| 5 | E. ½ of NE. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| 8 | Lot 1 | ..... | ..... | 28 | ..... | ..... | ..... | ..... |
| 8 | Lot 7, SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 73 |
| 9 | Lots 2, 3, 4, 5, 7 | ..... | ..... | 189 | ..... | ..... | ..... | ..... |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Lands belonging to State of Wisconsin. | | Lands belonging to private parties and corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township 42 north, range 5 east of P. M.*—Cont'd. | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 9 | Lots 1, 6, 8, SW. ¼ of SW. ¼ | | | | | | | 166 |
| 10 | Lots 2, 3, SE. ¼ of SE. ¼ | | | | | | | 90 |
| 10 | SE. ¼ of SW. ¼, SW. ¼ of SE. ¼ | | | 75 | | | | |
| 11 | Lots 1, 2, 3, 4, 5, 6, 7, 8 | | | 277 | | | | |
| 12 | Lots 1, 2, 3, 4, 5, 6 | | | 199 | | | | |
| 13 | Lot 6 | | | | | | | 26 |
| 13 | Lots 1, 2, 3, 4, 5, 7, 8, NE. ¼ of SW. ¼ | | | 279 | | | | |
| 14 | Lots 1, 2, 3, 9, 10 | | | | | | | 120 |
| 14 | Lots 4, 5, 6, 7, 8 | | | 191 | | | | |
| 15 | Lots 1, 2, 3, 4, N. ½ of N. ½ | | | 280 | | | | |
| 15 | Lots 5, 6, 7 | | | | | | | 57 |
| 16 | N. ½ of NE. ¼, NE. ¼ of NW. ¼, SE. ¼ | | 275 | | | | | |
| 17 | NE. ¼ of NE. ¼ | | | | | | | 40 |
| 22 | Lots 1, 6, 7 | | | 149 | | | | |
| 22 | Lots 2, 3, 4, 5 | | | | | | | 131 |
| 23 | Lots 4, 5 | | | 43 | | | | |
| 23 | Lots 1, 2, 3, 6, 7, 8 | | | | | | | 217 |
| 24 | NW. ¼ and SE. ¼ of SW. ¼ | | | | | | | 75 |
| 24 | SW. ¼ of SW. ¼ | | | 33 | | | | |
| 25 | Lots 1, 5, NE. ¼ of NW. ¼ | | | 35 | | | | |
| 25 | Lots 2, 3, 4 | | | | | | | 148 |
| 26 | Lot 1 | | | 38 | | | | |
| 26 | Lots 2, 3 | | | | | | | 56 |
| 31 | Lots 2, 3, 4 | 100 | | | | | | |
| 31 | Lot 1 | | | | 41 | | | |
| 36 | Lots 1, 2, SE. ¼ of NW. ¼, NE. ¼ of SW. ¼ | | | | | | | 119 |
| 36 | SE. ¼ | | | 145 | | | | |
| | *Township 42 north, range 6 east of 4th P. M.* | | | | | | | |
| 3 | SW. ¼ of SW. ¼ | | | | | | | 40 |
| 4 | S. ½ of SE. ¼ | | | | | | | 80 |
| 6 | NW. ¼ | | | 92 | | | | |
| 6 | SW. ¼ | | | | | | | 57 |
| 7 | SE. ¼ of SE. ¼ | | | | | | | 35 |
| 8 | S. ½ of SW. ¼, SE. ¼, SE. ¼ of NE. ¼ | | | | | | | 260 |
| 9 | W. ½ of SW. ¼, S. ½ and NE. ¼ of NW. ¼, NW. ¼ of NE. ¼ | | | | | | | 230 |
| 9 | SW. ¼ and NE. ¼ of NE. ¼ | | | 80 | | | | |
| 17 | N. ½ of NW. ¼, NW. ¼ of NE. ¼, SW. ¼ of SW. ¼ | | | | | | | 236 |
| 18 | NW. ¼, N. ½ of NE. ¼, SE. ¼ | | | | | | | 92 |
| 18 | SE. ¼ of NE. ¼ | 16 | | | | | | |
| 18 | S. ½ of SW. ¼ | | | 24 | | | | |
| 19 | NE. ¼ of NW. ¼, NE. ¼ | | | | | | | 95 |
| 20 | NW. ¼, SW. ¼ of NE. ¼, N. ½ of SW. ¼, SE. ¼ of SW. ¼, W. ½ and SE. ¼ of SE | | | | | | | 398 |
| 21 | W. ½ of SW. ¼, E. ½ of NW. ¼, SW. ¼ of SE. ¼ | | | | | | | 185 |
| 21 | E. ½ of SW. ¼ | | | 70 | | | | |
| 27 | SW. ¼ of SW. ¼ | | | 35 | | | | |
| 28 | N. ½ and SE. ¼ of SE. ¼ | | | 105 | | | | |
| 28 | W. ½ and SE. ¼ of NE. ¼ | | | | | | | 105 |
| 29 | N. E. ¼ of NE. ¼ | | | | | | | 40 |
| 31 | S. ½ of S. ½ | | | | | | | 126 |
| | *Township 43 north, range 5 east of 4th P. M.* | | | | | | | |
| 32 | E. ½ of SE. ¼ | | | 80 | | | | |
| 33 | S. ½ and NW. ¼ of SW. ¼, NW. ¼ and SE. ¼ of SE. ¼ | | | 200 | | | | |
| 33 | NE. ¼ of SW. ¼, SW. ¼ of SE. ¼ | | | | | | | 80 |
| 34 | S. ½ of SW. ¼, SW. ¼ of SE. ¼ | 120 | | | | | | |

*Summary of lands damaged at the reservoirs on the Chippewa River and its tributaries.*

| Name of reservoir. | Lands belonging to State of Wisconsin. | | | Lands belonging to private parties and corporations. | | | United States and Indian reserve lands. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Swamp. | School. | Total. | Entered. | Railroad. | Total. | United States. | Indian. | Total. |
| | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| Bear Lake | 720.00 | 120.00 | 840.00 | 4,230.00 | ..... | 4,230.00 | ..... | ..... | ..... |
| Little Chief Lake | ..... | ..... | ..... | 2,693.91 | ..... | 2,693.91 | ..... | ..... | ..... |
| Moose Lake | 1,000.00 | 200.00 | 1,200.00 | 2,520.00 | 1,440.00 | 3,960.00 | 960.00 | ..... | 960.00 |
| Pa-kwa-wang | ..... | 520.00 | 520.00 | 5,969.18 | 7,274.73 | 13,243.91 | 1,658.73 | 7,378.94 | 9,037.67 |
| Courtes Oreilles | ..... | 286.75 | 286.75 | 925.95 | 3,364.93 | 4,290.88 | 2,108.87 | 3,410.91 | 5,519.78 |
| Paint Creek | 652.54 | ..... | 652.54 | 2,236.56 | 200.79 | 2,437.35 | ..... | ..... | ..... |
| Butternut Lake | 547.93 | ..... | 547.93 | 1,472.49 | 607.74 | 2,080.23 | 333.10 | ..... | 333.10 |
| Park Lake | 614.17 | ..... | 614.17 | 121.88 | 288.90 | 410.78 | 2,067.30 | ..... | 2,067.30 |
| Rest Lake | 217.00 | 275.00 | 492.00 | 3,233.00 | 41.00 | 3,274.00 | 3,657.00 | ..... | 3,657.00 |
| Bear Creek | 14,164.00 | 1,699.00 | 15,863.00 | 1,320.00 | 2,521.00 | 3,841.00 | 4,842.00 | 11,687.00 | 16,529.00 |
| Round Lake | 2,750.00 | 440.00 | 3,190.00 | 2,405.00 | 757.00 | 3,162.00 | 604.00 | ..... | 604.00 |
| Squaw Lake | 1,960.00 | 425.00 | 2,385.00 | 775.00 | 1,400.00 | 2,175.00 | 135.00 | 240.00 | 375.00 |
| Total | 22,625.64 | 3,965.75 | 26,591.39 | 27,902.97 | 17,896.09 | 45,799.06 | 16,366.00 | 22,716.85 | 39,082.85 |

NOTE.—Approximately correct.

APPENDIX *u*.

TABLE I.—WISCONSIN RIVER.

*Proposed reservoirs—Wisconsin River.*

| Designation of reservoir. | Location. | | | Elevation above the sea of low-water surface at dam-site. | Dimensions of dam. | | Dimensions of dike. | | Area of reservoir. | | Capacity of reservoir. | Area of watershed. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Section. | Township north. | Range east. | | Maximum height. | Length. | Maximum height. | Length. | Square miles. | Square feet. | Cubic feet. | Square miles. | Square feet. |
| Pelican | 6 | 36 | 9 | 1,520.83 | 28 | 800 | 15 | 3,625 | 13.45 | 374,964,480 | 5,153,180,527 | 301 | 8,391,398,400 |
| Sugar Camp | 17 | 39 | 9 | 1,562* | 12.5 | 23.5 | 4 | 260 | 5 | 139,392,000 | 1,356,284,160 | 60 | 1,672,704,000 |
| Otter Rapids | 36 | 40 | 9 | 1,578.07 | 22 | 1,300 | 5 | 700 | 30.74 | 856,982,016 | 7,389,727,488 | 447 | 12,461,644,800 |
| Tomahawk | 7 | 39 | 6 | 1,554.67 | 12 | 190 | ..... | ..... | 13.47 | 375,522,048 | 2,226,113,036 | 101.5 | 2,829,657,600 |
| Squirrel | 1 | 38 | 5 | 1,521.78 | 17 | 315 | ..... | ..... | 5.30 | 147,755,520 | 1,338,163,200 | 56 | 1,561,190,400 |
| Rice | 9 | 35 | 6 | ..... | 14 | 1,100 | ..... | ..... | 6 | 167,270,400 | 1,043,516,880 | 396 | 11,039,846,400 |
| Vieux Desert | 17 | 42 | 11 | ..... | ..... | ..... | ..... | ..... | 7 | 195,148,800 | 400,000,000 | 19 | 529,689,600 |
| Twin Lakes | 19 | 41 | 11 | ..... | ..... | ..... | ..... | ..... | 6.5 | 181,209,600 | 650,000,000 | 30 | 836,352,000 |
| | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 87.46 | 2,438,244,864 | 19,556,985,291 | 1,410.5 | 39,322,483,200 |

*Approximated.

APPENDIX *u*—Continued.

| Designation of reservoir. | Assuming one-third rainfall as available. | | | | Assuming one-fourth rainfall as available. | | | |
|---|---|---|---|---|---|---|---|---|
| | Net annual supply. | Surplus capacity. | Surplus supply. | Amount deliverable per second for 90 days. | Net annual supply. | Surplus capacity. | Surplus supply. | Amount deliverable per second for 90 days. |
| Pelican | 6, 836, 596, 800 | | 1, 683, 416, 273 | 662. 71 | 5, 166, 506, 400 | | 13, 325, 873 | 662. 71 |
| Sugar Camp | 1, 335, 840, 000 | 20, 444, 160 | | 171. 79 | 1, 016, 400, 000 | 339, 884, 160 | | 130. 71 |
| Otter Rapids | 10, 027, 628, 160 | | 2, 637, 900, 672 | 950. 32 | 7, 609, 990, 080 | | 220, 262, 592 | 950. 32 |
| Tomahawk | 2, 201, 580, 480 | 24, 532, 556 | | 283. 12 | 1, 690, 302, 240 | 535, 810, 796 | | 217. 37 |
| Squirrel | 1, 239, 427, 200 | 98, 736, 000 | | 159. 39 | 944, 961, 600 | 393, 201, 600 | | 121. 52 |
| Rice | 9, 130, 176, 000 | | 8, 086, 659, 120 | 134. 19 | 6, 865, 056, 000 | | 5, 821, 539, 120 | 134. 19 |
| Vieux Desert | 360, 096, 000 | 39, 904, 000 | | 46. 30 | 290, 400, 000 | 109, 600, 000 | | 37. 34 |
| Twin Lakes | 621, 456, 000 | 28, 544, 000 | | 79. 92 | 489, 968, 000 | 160, 032, 000 | | 63. 01 |
| | 31, 752, 800, 640 | 212, 160, 716 | 12, 407, 976, 065 | 2, 487. 74 | 24, 073, 584, 320 | 1, 538, 528, 556 | 6, 055, 127, 585 | 2, 317. 17 |

Net supply is after making allowance for evaporation over reservoir surface, assumed at 25 inches per annum.

Where one-third rainfall is counted on, the formula is: Net supply $= (A - A') \frac{R}{3} + A' \frac{R}{6} = \frac{R}{6} (2A - A')$

$A$ = area of watershed.
$A'$ = area of reservoir.
$R$ = mean annual rainfall = 30 inches.

Where one-fourth rainfall is counted on, the formula is: Net supply $= (A - A') \frac{R}{4} + A' \frac{R}{6} = \frac{R}{12} (3A - A')$

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

## APPENDIX *c*.

### TABLE II.—WISCONSIN RIVER.

*List of lands and approximate areas which will be overflowed by proposed reservoirs on the Wisconsin River.*

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| | *Township 35 north, range 5 east of 4th P. M.* | | | | | | | |
| 1 | S. ½ of NE. ¼ | 80 | | | | | | |
| 1 | N. ½ of NE. ¼ | | | | | | | 107 |
| | *Township 35 north, range 6 east of 4th P. M.* | | | | | | | |
| 1 | NW. ¼ of NW. ¼ | | | 55 | | | | |
| 1 | NE. ¼ of NW. ¼, N. ½ of NE. ¼ | | | | | | | 106 |
| 3 | W. ½ and SE. ¼ of NW. ¼, NE. ¼ of SW. ¼ | | | 135 | | | | |
| 3 | W. ½ of NE. ¼, NE. ¼ of NW. ¼, NW. ¼ of SW. ¼ | | | | | | | 192 |
| 4 | Lot 1, SE. ¼ of NE. ¼ | | | 101 | | | | |
| 4 | W. ½, N. ½ of SE. ¼, SW. ¼ of SE. ¼, W. ½ of NE. ¼ | | | | | | | 535 |
| 5 | NE. ¼ of NW. ¼, SE. ¼ of SE. ¼ | | | 95 | | | | |
| 5 | N. ½ of NE. ¼, NW. ¼ of NW. ¼ | | | | | | | 166 |
| 6 | S. ½ of N. ½ | 158 | | | | | | |
| 6 | N. ½ of N. ½ | | | | | | | 214 |
| 8 | N. ½ of NE. ¼ | | | 80 | | | | |
| 9 | NW. ¼ of NW. ¼ | | | 40 | | | | |
| 9 | NE. ¼ of NW. ¼, NW. ¼ of NE. ¼ | | | | | | | 70 |
| | *Township 36 north, range 5 east of 4th P. M.* | | | | | | | |
| 36 | NW. ¼ of NE. ¼, SE. ¼ of NE. ¼ | 80 | | | | | | |
| 36 | NE. ¼ of NE. ¼, SW. ¼ of NE. ¼, E. ½ of SE. ¼ | | | | | | | 160 |
| | *Township 36 north, range 6 east of 4th P. M.* | | | | | | | |
| 26 | SW. ¼ of SW. ¼ | 37 | | | | | | |
| 26 | N. ½ of SW. ¼, W. ½ of SE. ¼ | | | | | | | 137 |
| 27 | SW. ¼ of NE. ¼, SE. ¼ | 200 | | | | | | |
| 28 | W. ½ | | | | | | | 298 |
| 31 | S. ½ of NE. ¼, SE. ¼ | 240 | | | | | | |
| 31 | NE. ¼ of NE. ¼, SW ¼ of NW. ¼, SW. ¼ | | | | | | | 229 |
| 32 | NW. ¼ of NW. ¼ | | | 40 | | | | |
| 32 | SW. ¼ of SW. ¼ | 40 | | | | | | |
| 32 | SW. ¼ of NW. ¼, NW. ¼ of SW. ¼, SE. ¼ of SW. ¼, SW. ¼ of SE. ¼ | | | | | | | 160 |
| 33 | E. ½ of NW. ¼, NE. ¼ of SW. ¼, SE. ¼ | 202 | | | | | | |
| 33 | SE. ¼ of SW. ¼ | | | 22 | | | | |
| 34 | SW. ¼, NW. ¼ and S. ½ of SE. ¼ | 280 | | | | | | |
| 34 | S. ½ of NW. ¼ | | | 80 | | | | |
| 34 | NW. ¼ of NW. ¼, NE. ¼ of SE. ¼ | | | | | | | 80 |
| 35 | S. ½ of NE. ¼, S. ½ of SW. ¼, W. ½ and NE. ¼ of SE. ¼ | 180 | | | | | | |
| 35 | N. ½ of NE. ¼, W. ½ of NW. ¼, N. ½ of SW. ¼, SE. ¼ of SE. ¼ | | | | | | | 195 |
| 36 | SW. ¼, NE. ¼ and S. ½ of SE. ¼ | | | | | | | 280 |
| | *Township 37 north, range 8 east of 4th P. M.* | | | | | | | |
| 4 | NW. ¼ of NE. ¼, E. ½ and SW. ¼ of NW. ¼, N. ½ of SW. ¼ | | | 190 | | | | |
| 4 | NW. ¼ of NW. ¼, SW. ¼ of SW. ¼, NE. ¼ of NE. ¼ | | | | | | | 110 |
| 5 | Lots 1, 2, 3, 4, 5, 6, 7, 8, E. ½ of NW. ¼, E. ½ of SW. ¼ | | | | | | | 460 |
| 5 | W. ½ of W. ½ | 160 | | | | | | |
| 6 | E. ½, E. ½ of W ½ | 484 | | | | | | |
| 7 | N. ½ and SE. ¼ of NE. ¼ | 120 | | | | | | |
| 7 | SE. ¼ of NW. ¼, W. ½ of SE. ¼, SE. ½ of SE. ¼ | | | 160 | | | | |
| 7 | NE. ¼ of NW. ¼, SW. ¼ of NE. ¼, NE. ¼ of SE. ¼ | | | | | | | 120 |
| 8 | W. ½ of NW. ¼ | 80 | | | | | | |
| 8 | NW. ¼ of SE. ¼ | | | 40 | | | | |
| 8 | Lots 1, 2, 3, 4, 5, 6, N. ½ and SW. ¼ of SW. ¼, E. ½ of NW. ¼ | | | | | | | 350 |
| | NW. ¼ of NW. ¼, NW. ¼ of SW. ¼ | | | 70 | | | | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | | Acres | Acres | Acres | Acres | Acres | Acres | Acres |
| | *Township 37 north, range 8 east of 4th P. M.*—Cont'd. | | | | | | | |
| 9 | E. ½ of SW. ¼, SW. ¼ of SW. ¼, SE. ¼, SE. ¼ of NE. ¼, SW. ¼ of NW. ¼ | | | | | | | 320 |
| 10 | SW. ¼ of NW. ¼, W. ½ of SW. ¼, SE. ¼ of SW. ¼ | | | | | | | 155 |
| 11 | SE. ¼ of SE. ¼ | 40 | | | | | | |
| 11 | W. ½ and NE. ¼ of SE. ¼, E. ½ of NE. ¼ | | | | | | | 200 |
| 12 | S. ½ of NW. ¼ | 80 | | | | | | |
| 12 | N. ½ and SW. ¼ of SW. ¼, SW. ¼ of NE. ¼ | | | | | | | 160 |
| 13 | W. ½ of NW. ¼ | 80 | | | | | | |
| 13 | SW. ¼ | | | | | | | 160 |
| 14 | E. ½ of SE. ¼ and SW. ¼ of SE. ¼ | | | 110 | | | | |
| 14 | NE. ¼, S. ½ and NW. ¼ of NW. ¼, SW. ¼, NW. ¼ of SE. ¼ | | | | | | | 480 |
| 15 | NW. ¼ of SE. ¼ | | | 50 | | | | |
| 15 | NE. ¼, NW. ¼, N. ½ and SE. ¼ of SW. ¼, NE. ¼ of SE. ¼ | | | | | | | 450 |
| 16 | Entire section | | 640 | | | | | |
| 17 | SE. ¼ of SE. ¼ | 40 | | | | | | |
| 17 | E. ½ of NE. ¼, NE. ¼ of SE. ¼ | | | 120 | | | | |
| 20 | NE. ¼ of NE. ¼ | 40 | | | | | | |
| 20 | SE. ¼ of NE. ¼, NE. ¼ of SE. ¼ | | | | | | | 80 |
| 21 | N. ½ of SW. ¼ | 80 | | | | | | |
| 21 | E. ½ of NW. ¼ | | | 80 | | | | |
| 21 | W. ½ of NW. ¼, NW. ¼ of SE. ¼, SE. ¼ of SW. ¼ | | | | | | | 160 |
| 23 | NE. ¼ of NW. ¼, lots 7 and 8 | | | 110 | | | | |
| 23 | N. E. ¼ | | | | | | | 150 |
| 24 | NW. ¼, SW. ¼, S. ½ of SE. ¼ | | | | | | | 385 |
| 25 | Lots 8, 9, 10 | | | 75 | | | | |
| 25 | Lots 1, 2, 3, 4, 5, 6, 7, 11, NW. ¼ of NE. ¼, NE. ¼ of NE. ¼, SW. ¼ of SE. ¼ | | | | | | | 505 |
| 26 | S. ½ of SE. ¼, E. ½ of NE. ¼ | | | | | | | 160 |
| 35 | N. ½ of NE. ¼, NE. ¼ of NW. ¼, NE. ¼ of SE. ¼, SE. ¼ of NE. ¼ | | | | | | | 200 |
| 36 | Entire section | | | | | | | 620 |
| | *Township 37 north, range 9 east of 4th P. M.* | | | | | | | |
| 17 | N. ½ | | | | | | | 320 |
| 18 | E. ½ | | | | | | | 190 |
| 19 | Lot 2 | 20 | | | | | | |
| 19 | Lots 1, 3, 4, 5, 6, 7, S. ½ of SW. ¼ | | | | | | | 350 |
| 20 | W. ½ of NW. ¼ | | | | | | | 60 |
| 21 | SW. ¼ of SW. ¼ | | | | | | | 40 |
| 28 | SW. ¼ of SW. ¼ | | | 40 | | | | |
| 28 | Lots 4, 5, NW. ¼ of NW. ¼, SE. ¼ of NW. ¼, NE. ¼ of SW. ¼ | | | | | | | 180 |
| 29 | Lot 15 | | | 37 | | | | |
| 29 | Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 | | | | | | | 515 |
| 30 | SW. ¼ of SW. ¼ | 40 | | | | | | |
| 30 | NE. ¼, NW. ¼, SE. ¼, NW. ¼ and SE. ¼ of SW. ¼ | | | | | | | 530 |
| 31 | NW. ¼ of NW. ¼ | 42 | | | | | | |
| 31 | NW. ¼ of SE. ¼, SW. ¼, SW. ¼ and NE. ¼ of NW. ¼, S. ½ of NE. ¼ | | | 257 | | | | |
| 31 | N. ½ of NE. ¼ | | | | | | | 40 |
| 32 | N. ½ of NW. ¼, NW. ¼ of NE. ¼ | | | | | | | 112 |
| | *Township 38 north, range 5 east of 4th Meridian.* | | | | | | | |
| 1 | N. ½ of NW. ¼ | | | | | | | 80 |
| | *Township 38 north, range 6 east of 4th P. M.* | | | | | | | |
| 1 | Lots 1, 2, 3, 4 | | | | | | | 125 |
| 2 | NE. ¼ of NE. ¼ | | | | | | | 20 |
| | *Township 38 north, range 7 east of 4th P. M.* | | | | | | | |
| 3 | Lots 1, 2, 3, 4, 5, W. ½ of SW. ¼ | | | 230 | | | | |
| 4 | Lots 1, 4, 5, 6, SE. ¼ of SE. ¼ | | | 190 | | | | |
| 4 | Lots 2, 3 | | | | | | | 90 |
| 5 | Lots 1, 2, 3, 4, SW. ¼ of SW. ¼ | | | 150 | | | | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township 38 north, range 7 east of 4th P. M.*—Cont'd. | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 6 | Lots 1, 2, 3, 4, 5, 6 | ..... | ..... | 180 | ..... | ..... | ..... | ..... |
| 8 | Lots 1, 2, 3, 5, 6, NW. ¼ of NW. ¼ | ..... | ..... | 160 | ..... | ..... | ..... | ..... |
| 8 | Lots 4, 7, 8 | ..... | ..... | ..... | ..... | ..... | ..... | 102 |
| 9 | Lot 8 | ..... | ..... | 35 | ..... | ..... | ..... | ..... |
| 17 | Lots 2, 3, 4 | ..... | ..... | ..... | ..... | ..... | ..... | 90 |
| 13 | Lots 1, 2, 3, 4 | ..... | ..... | ..... | ..... | ..... | ..... | 120 |
| 13 | Lot 5 | ..... | ..... | 55 | ..... | ..... | ..... | ..... |
| 23 | SE. ¼ of SE. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 24 | Lots 3, 4, 5, 6, SW. ¼ of SW. ¼, lot 8, SW. ¼ of NW. ¼ | ..... | ..... | 270 | ..... | ..... | ..... | ..... |
| 24 | Lots 1, 2, 7, NW. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 150 |
| 25 | Lots 1, 2, 3, 4, 7, SW. ¼ of NW. ¼ | ..... | ..... | 195 | ..... | ..... | ..... | ..... |
| 25 | Lots 5, 6, N. ½ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 185 |
| 26 | NE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| | *Township 38 north, range 8 east of 4th P. M.* | | | | | | | |
| 1 | SE. ¼, NE. ¼, E. ½ of SW. ¼, SE. ¼ of NW. ¼ | 280 | ..... | ..... | ..... | ..... | ..... | ..... |
| 12 | NE. ¼ | 160 | ..... | ..... | ..... | ..... | ..... | ..... |
| 30 | SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 140 |
| 31 | Lot 2, NE. ¼ of NE. ¼ | ..... | ..... | 90 | ..... | ..... | ..... | ..... |
| 31 | Lot 6, S. ½ of SE. ¼ | 114 | ..... | ..... | ..... | ..... | ..... | ..... |
| 31 | Lots 1, 3, 4, 7, SW. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 173 |
| 32 | Lots 1, 2, 3, 5, 6, SW. ¼ of SW. ¼, SW. ¼ of SE. ¼, S. ½ of N. ½ | ..... | ..... | ..... | ..... | ..... | ..... | 360 |
| 32 | E. ½ of SE. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| 33 | W. ½ and SE. ¼ of SW. ¼ | ..... | ..... | 115 | ..... | ..... | ..... | ..... |
| 33 | SW. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| | *Township 38 north, range 9 east of 4th P. M.* | | | | | | | |
| 4 | W. ½ of NW. ¼, NW. ¼ of SW. ¼ | 120 | ..... | ..... | ..... | ..... | ..... | ..... |
| 4 | NE. ¼ of NE. ¼ | ..... | ..... | 26 | ..... | ..... | ..... | ..... |
| 5 | NW. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 5 | SE. ¼, S. ½ of NE. ¼, NW. ¼, SW. ¼ | 427 | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | Entire section | 604 | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | NW. ¼, W. ½ of NE. ¼, N. ½ of SW. ¼, NW. ¼ of SE. ¼ | 366 | ..... | ..... | ..... | ..... | ..... | ..... |
| | *Township 38 north, range 11 east of 4th P. M.* | | | | | | | |
| 2 | N. ½ and SW. ¼ of SW. ¼, S. ½ and NW. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | 145 | ..... | ..... |
| 3 | SW. ¼, NW. ¼, W. ½ and NE. ¼ of NE. ¼, W. ½ and SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 241 |
| 4 | SE. ¼, NE. ¼, S. ½ of NW. ¼, E. ½, SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 316 |
| 5 | NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 129 |
| 9 | NE. ¼, SW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 138 |
| 9 | SE. ¼ of SE. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | NE. ¼, SE. ¼, S. ½ of SW. ¼, NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 297 |
| 10 | NW. ¼ of SW. ¼ | 28 | ..... | ..... | ..... | ..... | ..... | ..... |
| 13 | S. ½ of SE. ¼, NE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | 120 | ..... | ..... |
| 14 | S. ½ and NW. ¼ of SW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 15 | S. ½ of SE. ¼, S. ½ and NW. ¼ of SW. ¼, W. ½ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 166 |
| 15 | N. ½ of SE. ¼, NE. ¼ of SW. ¼, E. ½ of NW. ¼ | ..... | ..... | 185 | ..... | ..... | ..... | ..... |
| 16 | N. ½ of NE. ¼, SE. ¼ of NE. ¼, E. ½ of SE. ¼, NE. ¼ of NW. ¼ | ..... | 220 | ..... | ..... | ..... | ..... | ..... |
| 20 | E. ½ of SE. ¼, NW. ¼ of SE. ¼, SW. ¼ of NE. ¼, SE. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 195 |
| 21 | S. ½ of NW. ¼, N. ½ and SW. ¼ of SW. ¼, E. ½ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 97 |
| 21 | N. ½ of NE. ¼, NE. ¼ of NW. ¼ | 32 | ..... | ..... | ..... | ..... | ..... | ..... |
| 22 | W. ½ of SW. ¼, NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 178 |
| 23 | N. ½, N. ½ of SW. ¼, NE. ¼ of SE. ¼, SE. ¼ of SE. ¼ | 480 | ..... | ..... | ..... | ..... | ..... | ..... |
| 24 | S. ½, S. ½ of NW. ¼ | 400 | ..... | ..... | ..... | ..... | ..... | ..... |
| 25 | NW. ¼, W. ½ of NE. ¼, W. ½ and NE. ¼ of SW. ¼ | 360 | ..... | ..... | ..... | ..... | ..... | ..... |
| 26 | E. ½ of SE. ¼ | 80 | ..... | ..... | ..... | ..... | ..... | ..... |
| 27 | NW. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 39 |
| 28 | S. ½ and NE. ¼ of NE. ¼, SE. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 121 |
| 28 | SW. ¼, SW. ¼ of NW. ¼ | 198 | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | SE. ¼, SE. ¼ of NE. ¼ | 200 | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | SW. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 35 | NW. ¼, NW. ¼ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 200 |
| 35 | E. ½ of SW. ¼, W. ½ of NE. ¼, W. ½ of SE. ¼ | ..... | ..... | ..... | 240 | ..... | ..... | ..... |
| 35 | E. ½ of NE. ¼, E. ½ of SE. ¼, SW. ¼ of SW. ¼ | 200 | ..... | ..... | ..... | ..... | ..... | ..... |
| 36 | W. ½ of NW. ¼ | 80 | ..... | ..... | ..... | ..... | ..... | ..... |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township 39 north, range 5 east of 4th P. M.* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 20 | NE. ¼ of SE. ¼ | 40 | | | | | | |
| 20 | SE. ¼ of SE. ¼ | | | 40 | | | | |
| 21 | S. ½ of NE. ¼, S. ½ of NW. ¼, SW. ¼, SE. ¼ | 480 | | | | | | |
| 22 | SW. ¼ of NW. ¼, W. ½ of SW. ¼ | 120 | | | | | | |
| 23 | SE. ¼ of SE. ¼ | 40 | | | | | | |
| 23 | SW. ¼ of SE. ¼ | | | | | | | 40 |
| 25 | SE. ¼ of NE. ¼, SW. ¼ of NW. ¼, NW. ¼ of SW. ¼, SE. ¼ | | | | | | | 380 |
| 26 | NE. ¼, E. ½ of NW. ¼, SW. ¼, N. ½ and SW. ¼ of SE. ¼ | 520 | | | | | | |
| 26 | W. ½ of NW. ¼, SE. ¼ of SE. ¼ | | | | | | | 120 |
| 27 | S. ½ of SW. ¼, S. ½ of SE. ¼ | 160 | | | | | | |
| 27 | W. ½ of NW. ¼, NW. ¼ of SW. ¼ | | | | | | | 120 |
| 28 | NE. ¼, E. ½ of NW. ¼, SE. ¼, E. ½ of SW. ¼ | 480 | | | | | | |
| 28 | W. ½ of NW. ¼ | | | | | | | 80 |
| 29 | NE. ¼, E. ½ and SW. ¼ of NW. ¼, N. ½ and SE. ¼ of SW. ¼, NW. ¼ of SE. ¼ | 280 | | | | | | |
| 29 | SW. ¼ of SW. ¼, NE. ¼ and S. ½ of SE. ¼ | | | | 160 | | | |
| 31 | E. ½ of NE. ¼, E. ½ of SE. ¼ | 160 | | | | | | |
| 32 | NW. ¼ of NE. ¼, E. ½ of NW. ¼ | | | 120 | | | | |
| 32 | W. ½ of N. W. ¼, SW. ¼ | 240 | | | | | | |
| 33 | NE. ¼ of NE. ¼ | 40 | | | | | | |
| 34 | NE. ¼, N. ½ of NW. ¼ | 240 | | | | | | |
| 34 | NE. ¼ of SE. ¼ | | | 40 | | | | |
| 34 | NW. ¼ of SE. ¼ | | | | | | | 40 |
| 35 | NE. ¼, NW. ¼ N. ½ and SE. ¼ of SE. ¼ | 440 | | | | | | |
| 35 | SW. ¼ of SE. ¼ | | | | | | | 40 |
| 36 | SW. ¼ of SW. ¼ | 40 | | | | | | |
| 36 | NE. ¼, E. ½ and SW. ¼ of NW. ¼, E. ½ and NW. ¼ of SW. ¼, NW. ¼ of SE. ¼ | | | | | | | 320 |
| | *Township 39 north, range 6 east of 4th P. M.* | | | | | | | |
| 3 | W. ½ of SW. ¼ | | | | | | | 80 |
| 4 | SE. ¼ of SE. ¼ | 40 | | | | | | |
| 4 | S. ½ of NW. ¼, SW. ¼, W. ½ of SE. ¼ | | | | | | | 260 |
| 5 | SW. ¼ of NE. ¼, S. ½ of NW. ¼, SW. ¼, W. ½ of SE. ¼ | | | | | | 276 | |
| 7 | NE. ¼ of NE. ¼ | | | | | | | 40 |
| 8 | N. ½ of NW. ¼ | | | | | | | 80 |
| 9 | NE. ¼ of NE. ¼ | 40 | | | | | | |
| 9 | NW. ¼ and S. ½ of NE. ¼, E. ½ of NW. ¼, lots 3, 5, 6, 7, and 8, NW. ¼ of SE. ¼ | | | | | | | 390 |
| 10 | W. ½ of NW. ¼, lots 4, 5, 6, 7 | | | | | | | 240 |
| 10 | Lot 3 | | | 30 | | | | |
| 11 | Lots 2, 3, 4, 5, and 6 | | | 200 | | | | |
| 11 | Lot 1, NE. ¼ of NE. ¼ | | | | | | | 65 |
| 12 | NW. ¼ of SE. ¼, lot 4 | | | 95 | | | | |
| 12 | Lots 1, 2, 3 | | | | | | | 150 |
| 13 | Lots 2, 3, 4, 5, and 6 | | | | | | | 200 |
| 13 | Lot 1 | | | 30 | | | | |
| 14 | Lots 1, 2, 4, 5, and 6 | | | 165 | | | | |
| 14 | Lots 3, 7, 8, and 9 | | | | | | | 95 |
| 15 | Lot 1 | | | 35 | | | | |
| 15 | Lot 7 | 60 | | | | | | |
| 15 | Lots 2, 3, 4, 5, 6, 8, 9, 10, SE. ¼ of SW. ¼ | | | | | | | 320 |
| 16 | Lots 1, 2, 3, 4, 5, 6, 7, 8 | | 260 | | | | | |
| 21 | Lots 1, 2, 3, 4, 5 | | | | | | | 180 |
| 22 | Lots 1, 2, 3, 4 | | | | | | | 140 |
| 23 | Lots 1, 2, 3, W. ½ of SW. ¼ | | | | | | | 180 |
| 24 | SE. ¼ of SE. ¼ | 40 | | | | | | |
| 24 | NE. ¼ and S. ½ of NE ¼, SE. ¼ of NW. ¼, lots 1, 2, 3, 4, NW. ¼ of SW. ¼, NE. ¼ of SE. ¼ | | | | | | | 400 |
| 25 | Lots 1, 2, 3, 4, 6, 9 | | | | | | | 210 |
| 25 | Lots 5, 7, 8 | 90 | | | | | | |
| 26 | SE. ¼ of NE. ¼ | | | | | | | 40 |
| 26 | E. ½ and SW. ¼ of SE. ¼ | 120 | | | | | | |
| 35 | N. ½ of NE. ¼ | | | 80 | | | | |
| 36 | Lots 1, 2, 3 | | | | | | | 90 |
| 30 | W. ½ of NW. ¼ | | | | | | | 80 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township 39 north, range 7 east of 4th P. M.* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 7 | S. ½ of SE. ¼ | 80 | | | | | | |
| 7 | SE. ¼ of SW. ¼, N. ½ of SE. ¼ | | | | | | | 120 |
| 8 | Lots 2, 4 | 85 | | | | | | |
| 8 | Lot 3, SW. ¼ of NW. ¼, NW. ¼ of SW. ¼ | | | | | | | 130 |
| 18 | Lots 1, 2, 4, 6, W. ½ of NE. ¼, N. ½ of SE. ¼ | 290 | | | | | | |
| 18 | Lot 3 | | | 45 | | | | |
| 18 | Lots 5, 7, SW. ¼ of SW. ¼ | | | | | | | 100 |
| 19 | Lot 1, NE. ¼ of SE. ¼ | | | 100 | | | | |
| 19 | Lot 6 | 38 | | | | | | |
| 19 | Lots 2, 3, 4, 5 | | | | | | | 115 |
| 29 | Lots 1, 2, 3, 4 | | | 195 | | | | |
| 30 | Lots 2, 3, 4, 5 | | | | | | | 110 |
| 31 | Lots 1, 2 | | | 100 | | | | |
| 32 | Lots 1, 2, 3, 4 | | | 150 | | | | |
| 33 | Lots 1, 3, 4, 5, NE. ¼ of NE. ¼, SW. ¼ of NE. ¼ | | | 205 | | | | |
| 33 | Lot 2 | | | | | | | 25 |
| 34 | Lot 1, 2 | | | 70 | | | | |
| | *Township 39 north, range 8 east of 4th P. M.* | | | | | | | |
| 36 | E. ½ of NE. ¼, E. ½ and SW. ¼ of SE. ¼ | | | | | | | 200 |
| | *Township 39 north, range 9 east of 4th P. M.* | | | | | | | |
| 17 | NE. ¼ of NE. ¼, NE. ¼ of NW. ¼, S. ½ of SW. ¼, S. ½ of SE. ¼ | | | 176 | | | | |
| 17 | NW. ¼ of NE. ¼, SE. ¼ of NE. ¼, SW. ¼ of NW. ¼, NW. ¼ of SW. ¼, NE. ¼ of SE. ¼ | | | | | | | 150 |
| 18 | SE. ¼ of SE. ¼ | | | | | | | 40 |
| 19 | E. ½ of NE. ¼ | | | | | | | 80 |
| 20 | N. ½ of NE. ¼, SW. ¼ of NE. ¼, N. ½ of NW. ¼, SW. ¼ of NW. ¼ | | | 164 | | | | |
| 20 | NW. ¼ of NW. ¼, SE. ¼ of NW. ¼, W. ½ of SW. ¼, SE. ¼ of SE. ¼ | | | | | | | 130 |
| 21 | NW. ¼ of NW. ¼, S. ½ of NW. ¼ | | | 76 | | | | |
| 21 | E. ½ and SW. ¼ of SW. ¼ | | | | | | | 97 |
| 29 | NE. ¼ of NE. ¼, W. ½ of NW. ¼, SW. ¼ of SW. ¼ | 121 | | | | | | |
| 29 | S. ½ of NE. ¼, SE. ¼ of NW. ¼, NE. ¼ of SW. ¼, W. ½ of SE. ¼ | | | 181 | | | | |
| 29 | SE. ¼ of SW. ¼ | | | | | | | 40 |
| 31 | E. ½ and SW. ¼ of SE. ¼ | | | 104 | | | | |
| 31 | S. ½ of NE. ¼, S. ½ and NW. ¼ of NW. ¼, SW. ¼, NW. ¼ of SE. ¼ | | | | | | | 400 |
| 32 | NE. ¼ and S. ½ of NE. ¼, NW. ¼ of NW. ¼, SE. ¼ of NW. ¼, N. ½ and SE. ¼ of SW. ¼, SE. ¼ | | | 387 | | | | |
| 32 | NE. ¼ of NW. ¼, SW. ¼ of NW. ¼ | | | | | | | 80 |
| 33 | NW. ¼, NE. ¼ of SW. ¼, SW. ¼ of SW. ¼ | | | 156 | | | | |
| 33 | SE. ¼ of SW. ¼ | 40 | | | | | | |
| | *Township 39 north, range 10 east of 4th P. M.* | | | | | | | |
| 1 | NE. ¼ of NE. ¼, SW. ¼ of NE. ¼, NW. ¼ | | | | | | | 112 |
| 2 | SE. ¼ of NE. ¼, NW. ¼ of SW. ¼, S. ½ of SW. ¼, NE. ¼ of SE. ¼, SW. ¼ of SE. ¼ | | | 181 | | | | |
| 2 | N. ½ of NW. ¼, SW. ¼ of SW. ¼ | | | | | | | 81 |
| 3 | S. ½ of NW. ¼, SW. ¼ | | | 196 | | | | |
| 4 | S. ½ and NW. ¼ of NE. ¼, SE. ¼ of NW. ¼, E. ½ of SE. ¼ | | | 199 | | | | |
| 4 | NE. ¼ of NW. ¼, E. ½ of SW. ¼, W. ½ of SE. ¼ | | | | | | | 191 |
| 9 | NW. ¼ of NE. ¼ | | | 40 | | | | |
| 9 | E. ½ and SW. ¼ of SE. ¼ | 120 | | | | | | |
| 9 | E. ½ and SW. ¼ of NE. ¼, NW. ¼ of SE. ¼ | | | | | | | 160 |
| 10 | SW. ¼, SW. ¼ of SE. ¼ | | | | | | | 200 |
| 14 | NW. ¼, SW. ¼ | 320 | | | | | | |
| 15 | NE. ¼ of NE. ¼, NE. ¼ of NW. ¼, SW. ¼ of SE. ¼ | | | 120 | | | | |
| 15 | SE. ¼ of NE. ¼, E. ½ of SE. ¼ | 120 | | | | | | |
| 15 | W. ½ of NE. ¼, NW. ¼ of SE. ¼ | | | | | | | 120 |
| 22 | NE. ¼ | 160 | | | | | | |
| 23 | NW. ¼ of NW. ¼ | 40 | | | | | | |
| 2 | NE. ¼ of NW. ¼ | | | | | | | 40 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | Section. | Entered. | Railroad. | | | |
| | *Township* 39 *north, range* 10 *east of 4th P. M.*—Cont'd. | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 24 | SE. ¼ of SE. ¼ | 40 | | | | | | |
| 24 | N. ½ and SW. ¼ of SE. ¼ | | | | | 120 | | |
| 25 | NE. ¼ of NE. ¼ | 40 | | | | | | |
| 25 | NW. ¼ and S. ½ of NE. ¼, NW. ¼ | | | | | | | 280 |
| | *Township* 39 *north, range* 11 *east of 4th P. M.* | | | | | | | |
| 4 | NW. ¼ of NE. ¼, NW. ¼ | | | | | 200 | | |
| 5 | SW. ¼ of NE. ¼, E. ½ of NW. ¼ | | | | | 120 | | |
| 5 | SE. ¼ of NE. ¼ | | | | | | | 40 |
| 5 | N. ½ and SW. ¼ of SE. ¼, E. ½ and SW. ¼ of SW. ¼ | | | 240 | | | | |
| 6 | SE. ¼ | | | 95 | | | | |
| 6 | E. ½ of NE. ¼, NW. ¼, SW. ¼ | | | | | | | 138 |
| 8 | NE. ¼, E. ½ of NW. ¼, N. ½ of SE. ¼ | | | | | 246 | | |
| 8 | W. ½ of NW. ¼ | | | 57 | | | | |
| 8 | W. ½ and SE. ¼ of SW. ¼, S. ½ of SE. ¼ | | | | | | | 67 |
| 9 | SW. ¼, W. ½ of SE. ¼ | 240 | | | | | | |
| 16 | SW. ¼ and N. ½ of NW. ¼ | | 120 | | | | | |
| 17 | NE. ¼ of NE. ¼ | 37 | | | | | | |
| 17 | SE. ¼ of SW. ¼, W. ½ of SE. ¼ | | | | | 82 | | |
| 17 | NW. ¼ and S. ½ of NE. ¼, W. ½ of NW. ¼, W. ½ of SW. ¼ | | | | | | | 201 |
| 19 | SW. ¼ of SW. ¼ | | | 40 | | | | |
| 19 | E. ½ and SW. ¼ of NE. ¼, E. ½ and NW. ¼ of SW. ¼, N. ½ of SE. ¼ | | | | | | | 257 |
| 20 | SW. ¼ of SE. ¼ | | | | | 36 | | |
| 20 | NW. ¼, SW. ¼ | | | | | | | 214 |
| 22 | E. ½ and SW. ¼ of SE. ¼ | | | | | 92 | | |
| 23 | S. ½ and NW. ¼ of NE. ¼, NW. ¼, SW. ¼, SE. ¼ | | | | | | | 400 |
| 24 | S. ½ of SW. ¼ | | | | | 80 | | |
| 25 | N. ½ and SW. ¼ of NW. ¼ | | | | | | | 120 |
| 26 | NE. ¼, NW. ¼, SW. ¼, NW. ¼ of SE. ¼ | | | | | 504 | | |
| 27 | SE. ¼ of SE. ¼ | 22 | | | | | | |
| 27 | NE. ¼, SE. ¼ of NW. ¼, SW. ¼, NE. ¼ of SE. ¼ | | | | | | | 212 |
| 28 | S. ½ of SW. ¼ | | | 44 | | | | |
| 28 | S. ½ of NE. ¼, S. ½ of NW. ¼, N. ½ of SW. ¼ | | | | | | | 180 |
| 29 | Entire section | | | | | | | 271 |
| 30 | W. ½ of NW. ¼ | | | 110 | | | | |
| 30 | E. ½ of NW. ¼, SW. ¼, SE. ¼ | | | | | | | 245 |
| 31 | SE. ¼ of NE. ¼, NW. ¼ of SE. ¼ | | | 40 | | | | |
| 31 | SE. ¼ of NE. ¼, NW. ¼, SW. ¼, NE. ¼ of SE. ¼ | | | | | | | 241 |
| 32 | Entire section | | | | | | | 375 |
| 33 | E. ½ of NE. ¼ | | | 53 | | | | |
| 33 | W. ½ of NE. ¼, NW. ¼, SW. ¼, SE. ¼ | | | | | | | 208 |
| 34 | NE. ¼, NW. ¼ | | | | | 155 | | |
| 35 | N. ½ of NW. ¼ | | | 80 | | | | |
| | *Township* 40 *north, range* 6 *east of 4th P. M.* | | | | | | | |
| 21 | NW. ¼, SW. ¼ | | | | | | | 320 |
| 28 | E. ½ and SW. ¼ of NW. ¼, N. ½ and SW. ¼ of SW. ¼ | | | | | | | 240 |
| 28 | NW. ¼ of NW. ¼ | 40 | | | | | | |
| 29 | NE. ¼, N. ½ of SE. ¼ | | | | | | 240 | |
| 31 | E. ½ of SE. ¼ | | | | | | 80 | |
| 32 | E. ½ and S. W. ¼ of NE. ¼, W. ½ and SE. ¼ of NW. ¼, SE. ¼ | | | | | | 400 | |
| 33 | S. ½ of NW. ¼, SW. ¼, S. ½ of SE. ¼ | | | | | | | 320 |
| 34 | S. ½ of SW. ¼ | | | | | | | 80 |
| | *Township* 40 *north, range* 9 *east of 4th P. M.* | | | | | | | |
| 24 | NE. ¼ of SW. ¼, W. ½ and SE. ¼ of SE. ¼ | | | 160 | | | | |
| 25 | E. ½ and NW. ¼ of NE. ¼, NE. ¼ of NW. ¼ | | | 160 | | | | |
| 36 | SE. ¼ of NE. ¼, SE. ¼ | | | 200 | | | | |
| | *Township* 40 *north, range* 10 *east of 4th P. M.* | | | | | | | |
| 3 | NW. ¼ of NW. ¼ | 32 | | | | | | |
| 3 | SW. ¼ of NE. ¼ | | | | | | | 40 |
| 3 | N. ½ of SW. ¼, NW. ¼ of NE. ¼, S. ½ and NE. ¼ of NW. ¼ | | | 224 | | | | |
| 4 | N. ½, SW. ¼, N. ½ and SW. ¼ of SE. ¼ | 505 | | | | | | |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township* 40 *north, range* 10 *east of* 4*th P. M.*—Cont'd. | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 5 | Fractions in NE. ¼ and in SE. ¼ | ..... | ..... | 98 | ..... | ..... | ..... | ..... |
| 5 | Fraction in SE. ¼ | 44 | ..... | ..... | ..... | ..... | ..... | ..... |
| 5 | NE. ¼ of SE. ¼, fractions in NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 98 |
| 8 | N. ½ of SE. ¼, fraction in SE. ¼ of SE. ¼ E. of river, S. ½ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 205 |
| 8 | NE. ¼ of NE. ¼, SE. ¼ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 80 |
| 8 | Fractions in NW. ¼ of NE. ¼ and NE. ¼ of NW. ¼ | ..... | ..... | 53 | ..... | ..... | ..... | ..... |
| 8 | Fractions in NW. ¼ of NE. ¼, E. of river and in SW. ¼ of SE. ¼ W. of river | 41 | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | Fractions in NW. ¼ of SE. ¼, E. ½ of NW. ¼, W. ½ of NE. ¼ | 191 | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | NW. ¼ of NW. ¼, E ½ of SW. ¼, E. ½ of SE. ¼ | ..... | ..... | 198 | ..... | ..... | ..... | ..... |
| 9 | Fraction in SW. ¼ of SE. ¼, SE. ½ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 45 |
| 13 | S. ½ and NE. ¼ of NE. ¼, N. ½ and SE. ¼ of SE. ¼, SW. ¼ of SW. ¼ | ..... | ..... | 220 | ..... | ..... | ..... | ..... |
| 13 | SE. ¼ of SW. ¼, fraction of SW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 30 |
| 14 | SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 115 |
| 15 | N. ½ of SE. ¼ | ..... | ..... | 62 | ..... | ..... | ..... | ..... |
| 15 | SW. ¼ of SE. ¼, SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 136 |
| 16 | SE. ¼ of SE. ¼, W. ½ of SW. ¼ | ..... | 120 | ..... | ..... | ..... | ..... | ..... |
| 17 | Fraction of NE. ¼ E. of river | ..... | ..... | ..... | ..... | ..... | ..... | 75 |
| 17 | E. ½ of NW. ¼, SE. ¼, E. ½ of SW. ¼, fraction of NE. ¼ W. of river | 220 | ..... | ..... | ..... | ..... | ..... | ..... |
| 20 | N. ½ of SE. ¼, fraction in SE. ¼ of SE. ¼ E. of river, N. ½ of SW. ¼, fraction in SW. ¼ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 181 |
| 20 | Fraction in S. ½ of SW. ¼ E. of river | ..... | ..... | 47 | ..... | ..... | ..... | ..... |
| 20 | N. ½ of NE. ¼, fraction in S. ½ of NE. ¼ W. of river, NE. ¼ of NW. ¼ | 128 | ..... | ..... | ..... | ..... | ..... | ..... |
| 21 | NE. ¼ of NE. ¼ | ..... | ..... | 33 | ..... | ..... | ..... | ..... |
| 21 | SE. ¼ of NE. ¼, E. ½ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 81 |
| 22 | N. ½, SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 253 |
| 22 | SE. ¼ | ..... | ..... | 87 | ..... | ..... | ..... | ..... |
| 23 | Entire section | ..... | ..... | ..... | ..... | ..... | ..... | 184 |
| 24 | W. ½ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 42 |
| 24 | NE. ¼, NE. ¼ of SW. ¼ | ..... | ..... | 97 | ..... | ..... | ..... | ..... |
| 25 | NW. ¼ of NE. ¼ | ..... | ..... | 41 | ..... | ..... | ..... | ..... |
| 25 | S. ½ and NE. ¼ of NE. ¼, SE. ¼, N. ½ of SW. ¼, S. ½ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 370 |
| 26 | NE. ¼, SE. ¼ of NW. ¼, NW. ¼ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 136 |
| 26 | W. ½ of NW. ¼ | 62 | ..... | ..... | ..... | ..... | ..... | ..... |
| 27 | NE. ¼ of SE. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 27 | E. ½ of NE. ¼, W. ½ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 160 |
| 28 | N. ½ of NE. ¼, fraction in SW. ¼ of SW. ¼ W. of river | ..... | ..... | 72 | ..... | ..... | ..... | ..... |
| 28 | S. ½ of NE. ¼, N. ½ of SE. ¼, N. ½ of SW. ¼, fraction of S. ½ of SW. ¼ E. of river | ..... | ..... | ..... | ..... | ..... | ..... | 211 |
| 28 | SE. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 29 | S. ½ of S. ½, NW. ¼ of NW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 164 |
| 30 | NE. ¼, W. ½ and SE. ¼ of NW. ¼, W. ½ of SE. ¼, SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 364 |
| 30 | SW. ¼, fraction of SW. ¼ of SE. ¼ W. of river | ..... | ..... | 151 | ..... | ..... | ..... | ..... |
| 31 | NE. ¼, fraction of E. ½ of NE. ¼ E. of river, N. ½ of SE. ¼, fraction of NE. ¼ of SE. ¼ E. of river | ..... | ..... | ..... | ..... | ..... | ..... | 253 |
| 31 | NW. ¼ W. of river, N. ½ of SW. ¼ | ..... | ..... | 135 | ..... | ..... | ..... | ..... |
| 32 | SE. ¼, N. ½ and SE. ¼ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 280 |
| 32 | N. ½ of N. ½ | ..... | ..... | 141 | ..... | ..... | ..... | ..... |
| 33 | S. ½ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 80 |
| 33 | NW. ¼ of SW. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 35 | SE. ¼ of SW. ¼, E. ½ of SE. ¼ | ..... | ..... | 73 | ..... | ..... | ..... | ..... |
| 35 | W. ½ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 42 |
| 36 | E. ½, E. ½ of NW. ¼, E. ½ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 205 |
| 36 | W. ½ of SW. ¼ | ..... | ..... | 59 | ..... | ..... | ..... | ..... |
| | *Township* 40 *north, range* 11 *east of* 4*th P. M.* | | | | | | | |
| 4 | NW. ¼ and S. ½ of NW. ¼, SW. ¼, NW. ¼ and S. ½ of SE. ¼ | ..... | ..... | ..... | ..... | 400 | ..... | ..... |
| 5 | E. ½ of NE. ¼, N. ½ and SE. ¼ of SE. ¼ | 160 | ..... | ..... | ..... | ..... | ..... | ..... |
| 5 | SW. ¼ of NE. ¼, NE. ¼ of SW. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| 5 | SE. ¼ of SW. ¼, SW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 45 |

*List of lands and approximate areas which will be overflowed, &c.*—Continued.

| Section. | Description. | Transferred to State of Wisconsin. | | Transferred to private parties or corporations. | | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|---|---|---|
| | | Swamp. | School. | Entered. | Railroad. | | | |
| | *Township* 40 *north, range* 11 *east of 4th P. M.*—Con'td. | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* | *Acres* |
| 7 | E. ½ and SW. ¼ of SW. ¼, NW. ¼ of SE. ¼ | ..... | ..... | 180 | ..... | ..... | ..... | ..... |
| 7 | E. ½ and SW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 120 |
| 8 | E. ½ of NE. ¼ | 63 | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | NE. ¼ of SW. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 8 | W. ½ of NE. ¼, E. ½ and SW. ¼ of NW. ¼, W. ½ of SW. ¼, N. ½ of SE. ¼ | ..... | ..... | ..... | ..... | 320 | ..... | ..... |
| 9 | N. ½ and SW. ¼ of NW. ¼ | 120 | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | W. ½ and SE. ¼ of NE. ¼, SE. ¼ of NW. ¼, NW. ¼ of SW. ¼ | ..... | ..... | 200 | ..... | ..... | ..... | ..... |
| 18 | NW. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | 40 | ..... | ..... |
| 18 | N. ½ and SW. ¼ of NW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 19 | E. ½ and SW. ¼ of SW. ¼, SE. ¼ | ..... | ..... | 280 | ..... | ..... | ..... | ..... |
| 27 | N. ½ and SW. ¼ of NW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 28 | S. ½ of NE. ¼, E. ½ and SW. ¼, of SW. ¼, N. ½ and SW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | 320 | ..... | ..... |
| 29 | NW. ¼ of NW. ¼ | ..... | ..... | 43 | ..... | ..... | ..... | ..... |
| 29 | SW. ¼ of NW. ¼, NW. ¼ of SW. ¼ | 52 | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 30 | SE. ¼ of NE. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 30 | N. ½ and SW. ¼ of NE. ¼, SE. ¼ of NW. ¼ | ..... | ..... | 153 | ..... | ..... | ..... | ..... |
| 30 | N. ½ of NW. ¼, W. ½ and SE. ¼ of SW. ¼, SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 213 |
| 31 | NE. ¼ of NE. ¼, SW. ¼ of NW. ¼, SE. ¼ of SW. ¼, SW. ¼ of SE. ¼ | ..... | ..... | 95 | ..... | ..... | ..... | ..... |
| 31 | S. ½ of NE. ¼, N. ½ of NW. ¼, W. ½ of SW. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 151 |
| 31 | E. ½ of SE. ¼ | 53 | ..... | ..... | ..... | ..... | ..... | ..... |
| 32 | NE. ¼, NW. ¼, SW. ¼ | ..... | ..... | ..... | ..... | 476 | ..... | ..... |
| 33 | SW. ¼ of SE. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| | *Township* 41 *north, range* 10 *east of 4th P. M.* | | | | | | | |
| 27 | N. ½ and SE. ¼ of SW. ¼ | ..... | ..... | 120 | ..... | ..... | ..... | ..... |
| 27 | SW. ¼ of SW. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 28 | SE. ¼, S. ½ of SW. ¼ | 240 | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | S. ½ of SE. ¼, S. ½ of SW. ¼ | 160 | ..... | ..... | ..... | ..... | ..... | ..... |
| 30 | SE. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 30 | NE. ¼ of SE. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 31 | NE. ¼ of NE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 40 |
| 31 | SE. ¼ of NE. ¼ | ..... | ..... | 40 | ..... | ..... | ..... | ..... |
| 31 | SW. ¼ of NE. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 32 | NW. ¼ of NE. ¼, SE. ¼ of NE. ¼, NW. ¼ of SE. ¼ | ..... | ..... | ..... | ..... | ..... | ..... | 120 |
| 32 | E. ½ and SW. ¼ of SE. ¼, N. ½ of NW. ¼ | 200 | ..... | ..... | ..... | ..... | ..... | ..... |
| 32 | SE. ¼ of SW. ¼, SW. ¼ of NW. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| 33 | N. ½ SW. ¼, W. ½ of SE. ¼ | 560 | ..... | ..... | ..... | ..... | ..... | ..... |
| 34 | NW. ¼ of NW. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |
| 34 | NE. ¼ of NW. ¼, SW. ¼ of NW. ¼ | ..... | ..... | 80 | ..... | ..... | ..... | ..... |
| | *Township* 41 *north, range* 11 *east of 4th P. M.* | | | | | | | |
| 33 | SE. ¼ of SW. ¼ | 40 | ..... | ..... | ..... | ..... | ..... | ..... |

In addition to the preceding, all lots in township 41 north, ranges 10 and 11 east of 4th P. M., and township 42 north, range 11 east, which border on Twin Lakes and Lake Vieux Desert.

Neither the acreage nor description of these lots can be given from data at hand in this office.

SUMMARY BY RESERVOIRS.

*Overflowed lands.*

| Designation of reservoir. | Transferred to State of Wisconsin. | Transferred to private parties and corporations. | Military wagon-road grant. | Chippewa Indian Reservation. | United States public lands. |
|---|---|---|---|---|---|
| | *Acres.* | *Acres.* | *Acres.* | *Acres.* | *Acres.* |
| Pelican | 2,500 | 1,624 | ..... | ..... | 8,275 |
| Sugar Camp | 1,678 | 1,270 | ..... | ..... | 1,257 |
| Otter Rapids | 6,721 | 6,142 | 3,456 | ..... | 11,149 |
| Tomahawk | 1,223 | 2,965 | ..... | 996 | 5,722 |
| Squirrel | 3,280 | 360 | ..... | ..... | 1,220 |
| Rice | 1,497 | 648 | ..... | ..... | 2,989 |
| Total | 16,899 | 13,009 | 3,456 | 996 | 30,612 |
| Grand total | ..... | ..... | ..... | ..... | 64,972 |

NOTE.—Approximately correct.

The preceding schedule comprises all water lots and 40-acre fractions of which the whole or any part would be submerged by proposed storage reservoirs on the Wisconsin River.

On the town plats from which this list was made up, the water lots were in some cases indicated by number, but acreage not given; in some cases the acreage was given, but not the numbers; while in other cases neither number nor acreage were given. Hence it was often impossible to schedule with strict accuracy the precise acreage or correct description of overflowed land.

Where ambiguity appears it may be removed by reference to the accompanying colored plats on which a dotted line shows the limit of flowage.

The United States public lands are shown in blue. Lands within Indian reservation, blue with "I. R." All other land in sections partly overflowed, colored red.

On the plats from Wausau land office, many tracts are shown as "Entered," "R. R.," &c., which lie within the limits shown on general maps as the "Flambeau Reservation." There are no data at hand in this office for explaining this discrepancy.

## APPENDIX *w*.

RESERVOIRS.

*Existing sluicing-dams on Chippewa and Wisconsin Rivers and tributaries, at or near proposed dam-sites, where surveys for reservoirs have been made.*

| Name of stream upon which located. | Location of dam. | Parties to whom charter was granted. | When granted. |
|---|---|---|---|
| Little Chief River | NE. ¼ section 26, township 40 north, range 7 west. | A. J. Hayward and W. E. McCord. | 1879 |
| Round Lake | Section 23, township 40 north, range 3 east. | Henry Hewett and Eric McArthur. | 1878 |
| Courtes Oreilles River | East of east line of township 38 north, range 8 west. | Fredric G. Stanley, Emory D. Stanley, Burt E. Reid. | 1878 |
| Butternut Creek* | Section 18, township 40 north, range 1 west. | ..... | ..... |
| Bear Lake* | Section 26, township 41 north, range 4 west. | ..... | ..... |
| Near Moose Lake* | Section 14, township 41 north, range 6 west. | ..... | ..... |
| West Fork Chippewa River* | Section 32, township 42 north, range 5 west. | ..... | ..... |
| Outlet of Pokegama Lake* | Section 32, township 40 north, range 6 west. | ..... | ..... |
| Pelican Dam*† | Section 6, township 36 north, range 9 east. | ..... | ..... |
| Otter Rapids*‡ | Section 36, township 40 north, range 9 east. | ..... | ..... |

*Can find no record of charters granted for dams at these locations.
†Flowage on Wisconsin River. ‡Principal flowage on Eagle River.

## APPENDIX *x*.

### RESERVOIRS.

*Table of watersheds tributary to the Mississippi River above the Ohio, taken from General Warren's report on bridging the Mississippi River.*

| Name. | Miles drained. | Total miles drained. | Distance apart. | Total distance. | Right bank. | Left bank. |
|---|---|---|---|---|---|---|
| Minnesota River | 310 | 310 | ..... | ..... | R. B. | ..... |
| Whetstone or Izuza River | 110 | 420 | 30 | 30 | R. B. | ..... |
| Yellow Banks River | 340 | 760 | 6 | 36 | R. B. | ..... |
| Pomme de Terre River | 960 | 1, 720 | 13 | 49 | ..... | L. B. |
| Lac-qui-parle River | 830 | 2, 550 | 15 | 64 | R. B. | ..... |
| Chippewa River | 1, 970 | 4, 520 | 10 | 74 | ..... | L. B. |
| Yellow Medicine River | 650 | 5, 170 | 20 | 94 | R. B. | ..... |
| Chetomba or Hawk Creek | 470 | 5, 640 | 1 | 95 | ..... | L. B. |
| Redwood River | 770 | 6, 410 | 20 | 115 | R. B. | ..... |
| Beaver Creek | 240 | 6, 650 | 2 | 117 | ..... | L. B. |
| Big Cottonwood River | 980 | 7, 630 | 37 | 154 | R. B. | ..... |
| Little Cottonwood River | 245 | 7, 875 | 4 | 158 | R. B. | ..... |
| Blue Earth River | 3, 350 | 11, 225 | 16 | 174 | R. B. | ..... |
| Cherry Creek | 57 | 11, 282 | 15 | 189 | R. B. | ..... |
| Little Le Sueur River | 144 | 11, 426 | 7 | 196 | R. B. | ..... |
| Rush River | 102 | 11, 528 | 2 | 198 | ..... | L. B. |
| High Island Creek | 75 | 11, 603 | 6 | 204 | ..... | L. B. |
| Sand Creek | 234 | 11, 837 | 18 | 222 | R. B. | ..... |
| Carver Creek | 100 | 11, 937 | 1 | 223 | ..... | L. B. |
| Credit River | 140 | 12, 077 | 15 | 238 | R. B. | ..... |
| Nine-Mile Creek | 42 | *12, 119 | 2 | 240 | ..... | L. B. |
| Mississippi River | 21, 600 | 33, 719 | 9 | 249 | ..... | L. B. |
| Saint Croix River and Lake | 7, 568 | 41, 287 | 30 | 279 | ..... | L. B. |
| Vermillion River | 237 | 41, 524 | 3 | 282 | R. B. | ..... |
| Trimbelle River | 95 | 41, 619 | 9 | 291 | .... | L. B. |
| Cannon River | 1, 639 | 43, 258 | 5 | 296 | R. B. | ..... |
| Isabelle River | 73 | 43, 331 | 5 | 301 | ..... | L. B. |
| Rush River | 183 | 43, 514 | 4 | 305 | ..... | L. B. |
| Chippewa River | 9, 602 | 53, 116 | 18 | 323 | .... | L. B. |
| Beef River | 452 | 53, 568 | 9 | 332 | ..... | L. B. |
| Zumbro River | 1, 366 | 54, 934 | 9 | 341 | R. B. | ..... |
| Whitewater River | 382 | 55, 316 | 1 | 342 | R. B. | ..... |
| Eagle Creek | 158 | 55, 474 | 9 | 351 | ..... | L. B. |
| Rolling Stone Creek | 136 | 55, 610 | 6 | 357 | R. B. | ..... |
| Trempeleau River | 700 | 56, 310 | 10 | 367 | ..... | L. B. |
| Black River | 2, 880 | 59, 190 | 18 | 385 | ..... | L. B. |
| La Crosse River | 463 | 59, 653 | ..... | 385 | ..... | L. B. |
| Root River | 1, 685 | 61, 338 | 4 | 389 | R. B. | ..... |
| Raccoon Creek | 139 | 61, 477 | 7 | 396 | ... | L. B. |
| Crooked Creek | 70 | 61, 547 | 3 | 399 | R. B. | ..... |
| Badaxe River | 180 | 61, 727 | 7 | 406 | ..... | L. B. |
| Upper Iowa River | 939 | 62, 666 | 3 | 409 | R. B. | ..... |
| Paint Creek | 70 | 62, 736 | 25 | 434 | R. B. | ..... |
| Yellow River | 279 | 63, 015 | 4 | 438 | R. B. | ..... |
| Wisconsin River | 11, 850 | 74, 865 | 7 | 445 | ..... | L. B. |
| Turkey River | 1, 679 | 76, 544 | 21 | 466 | R. B. | ..... |
| Grant River | 289 | 76, 833 | 13 | 479 | ..... | L. B. |
| Platte River | 306 | 77, 139 | 6 | 485 | .. | L. B. |
| Little Makoqueta | 150 | 77, 289 | 3 | 488 | R. B. | ..... |
| Catfish Creek | 75 | 77, 364 | 7 | 495 | R. B. | ..... |
| Big Menomonee Creek | 32 | 77, 396 | 4 | 499 | ..... | L. B. |
| Sinsinawa Creek | 50 | 77, 446 | 4 | 503 | ..... | L. B. |
| Tête de Mort Creek | 45 | 77, 491 | 1 | 504 | R. B. | ..... |
| Fever River | 185 | 77, 676 | 3 | 507 | ..... | L. B. |
| Mill Creek | 35 | 77, 711 | 7 | 514 | R. B. | ..... |
| Makoqueta River | 1, 863 | 79, 514 | 7 | 521 | R. B. | ..... |
| Apple River | 245 | 79, 819 | 4 | 525 | .... | L. B. |
| Rush Creek | 85 | 79, 904 | 2 | 527 | ..... | L. B. |
| Plum River | 280 | 80, 184 | 6 | 533 | ..... | L. B. |
| Wapsipinicon River | 2, 490 | 82, 674 | 28 | 561 | R. B. | ..... |
| Rock River | 10, 690 | 93, 364 | 25 | 586 | ..... | L. B. |
| Copperas Creek | 25 | 93, 389 | 26 | 612 | ..... | L. B. |
| Iowa River | 12, 250 | 105, 639 | 15 | 627 | R. B. | ..... |
| Edward's River | 43 | 105, 682 | 2 | 629 | ..... | L. B. |
| Pope Creek | 135 | 105, 817 | 4 | 633 | ..... | L. B. |
| Henderson River | 625 | 106, 442 | 18 | 651 | ..... | L. B. |
| Flint Creek | 165 | 106, 607 | 4 | 655 | R. B. | ..... |

* Total of Minnesota rivers.

*Table of watersheds tributary to the Mississippi River, above the Ohio, &c.*—Continued.

| Name. | Miles drained. | Total miles drained. | Distance apart. | Total distance. | Right bank. | Left bank. |
|---|---|---|---|---|---|---|
| Ellison's Creek | 104 | 106, 711 | 3 | 658 | ..... | L. B. |
| Honey Creek | 65 | 106, 776 | 5 | 663 | ..... | L. B. |
| Skunk River | 4, 322 | 111, 098 | 1 | 664 | R. B. | ..... |
| Sugar Creek | 150 | 111, 248 | 18 | 682 | R. B. | ..... |
| Des Moines River | 14, 955 | 126, 203 | 32 | 714 | R. B. | ..... |
| Fox River | 479 | 126, 682 | 4 | 718 | R. B. | ..... |
| Bear Creek | 418 | 127, 100 | 15 | 733 | ..... | L. B. |
| Wyaconda Creek | 480 | 127, 580 | 5 | 738 | R. B. | ..... |
| Fabius River | 1, 590 | 129, 170 | 13 | 751 | R. B. | ..... |
| North River | 465 | 129, 635 | 2 | 753 | R. B. | ..... |
| Mill Creek | 96 | 129, 731 | 3 | 756 | ..... | L. B. |
| McDonald's Creek | 140 | 129, 871 | 13 | 769 | ..... | L. B. |
| Salt River | 2, 741 | 132, 612 | 18 | 787 | R. B. | ..... |
| Noix Creek | 52 | 132, 664 | 3 | 790 | R. B. | ..... |
| Buffalo Creek | 40 | 132, 704 | 1 | 791 | R. B. | ..... |
| Bobb's Creek | 90 | 132, 794 | 13 | 804 | R. B. | ..... |
| Gwinn's Creek | 25 | 132, 819 | 2 | 806 | R. B. | ..... |
| Bryant's Creek | 75 | 132, 894 | 19 | 825 | R. B. | ..... |
| Cuivre Creek | 1, 180 | 134, 074 | 9 | 834 | R. B. | ..... |
| Perogue Creek | 90 | 134, 164 | 3 | 837 | R. B. | ..... |
| Dardenne Creek | 110 | 134, 274 | 6 | 843 | R. B. | ..... |
| Illinois River | 27, 465 | 161, 739 | 8 | 851 | ..... | L. B. |
| Big Piasa Creek | 100 | 161, 839 | 10 | 861 | ..... | L. B. |
| Missouri River | 518, 000 | 679, 839 | 10 | 871 | R. B. | ..... |
| Wood River | 145 | 679, 984 | .... | 871 | ..... | L. B. |
| Cahokia Creek | 400 | 680, 384 | 17 | 888 | ..... | L. B. |
| Meramec River | 3, 715 | 684, 099 | 18 | 906 | R. B. | ..... |
| Eagle Creek | 70 | 684, 169 | 7 | 913 | ..... | L. B. |
| Platin Creek | 110 | 684, 279 | 5 | 918 | R. B. | ..... |
| L'isle de Bois Creek | 50 | 684, 329 | 9 | 927 | R. B. | ..... |
| Establishment River | 110 | 684, 439 | 6 | 933 | R. B. | ..... |
| Rivière aux Vases | 100 | 684, 539 | 4 | 937 | R. B. | ..... |
| Saline River | 240 | 684, 779 | 12 | 949 | R. B. | ..... |
| Kaskaskia River | 5, 660 | 690, 439 | 7 | 956 | ..... | L. B. |
| Saint Mary's River | 215 | 690, 654 | 4 | 960 | ..... | L. B. |
| Brazos Creek | 40 | 690, 694 | 24 | 984 | R. B. | ..... |
| Big Muddy River | 2, 245 | 692, 939 | 6 | 990 | ..... | L. B. |
| Apple Creek | 200 | 693, 139 | 1 | 991 | R. B. | ..... |
| Clear Creek | 135 | 693, 274 | 18 | 1, 009 | ..... | L. B. |
| Ohio River | ..... | ..... | 42 | 1, 051 | ..... | ..... |